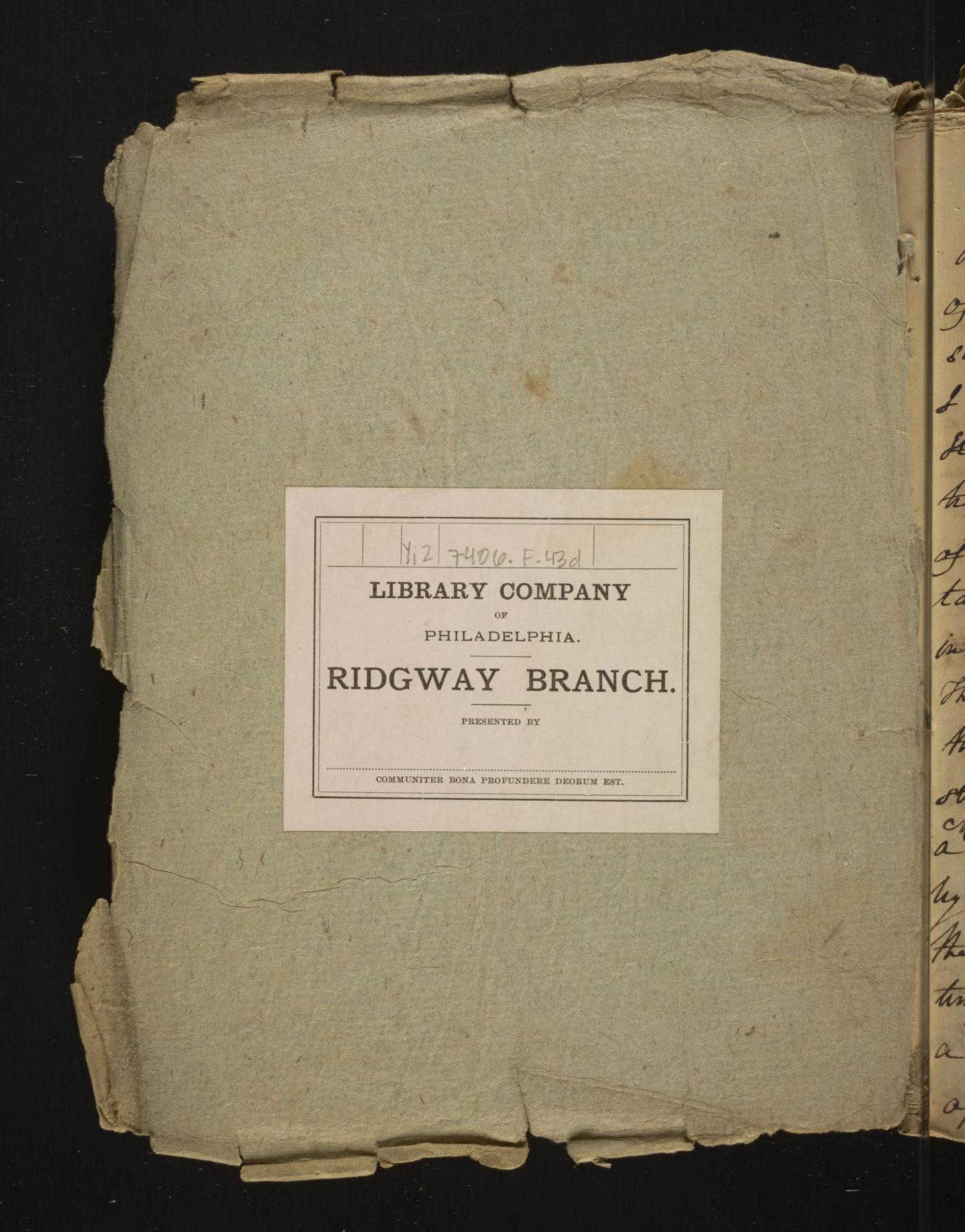
Introductory Ecture...



I have come before your Justimen to activer on betra du chow to the hetary of the late Dr Benjamin Rush, on the m stitutes and practice of medicine, which I shall read during the ensuing winter It is common on oceasion, like the present to give a history of the origin and progress of the branches of medical science to be taught and to announce the plan of bethertion contineplated in them. The hotung I will read have a halve That will be best recioned by the intire study of them, and they have long popular a france that hundery any alune ment offerd by the promulgation of their plan, altoge ther unnessiony - (hor will I accuracy your time with the history of medicine. Such a history can propose nothing new, and Offer no instruction that has not long

adoctions to usmons parts of this lecture Much has been said by pathalogical and authory of venerous and artiseal Conjustions on plethonas, The vienes of have quen, will shaw that a uenaus plethora cannot take place from mere rapidly 九 of circulation, and can only arrise from re abstruction of the users, or from the contraction = Cu of the universal areas of the arter is - whe The Then the an artisial plethones can take blace from the exertion of the tonicity of the views, may maguine further observa a weak or strong arction of the heart on or an abstanction of the lange trunks of wing the or arteries, cannot atter the flux of blood on Atmo the circuit - for since that alistanction at is in the cause of the circle, the obstice of

ago income familiar to the youngest student hor would I wellingly hel quelty of tour mackery of your knowledge by repeat ing that which forms the preface to almost every hook in the secures. - The historical intraductions and theatises son common un our books and between, have always apo peased to the to be the more apolagingon thanghe, the substitution of the warteful am playment of transcribing, for the unful ac: : enpation of reflection. and even under the mast myeniaus and sluguent forms in which They can be presented, they seem like the afring up of time only for the purpose of sacrificing it in formation in the sacrification ent strongelous som Sheir fraint Suntas some la Bern frage. win that to be was as this dust berg of me win in the for expected so much some aix among ment. the when of wach man that all il Egiton fie commention of opinions come

Sauce (the heart) from which any pletime and coursed by that alytruction, must proceed-If the obstruction should be complete no more Que -Cauli be sout on from the heart than the Land contact of the vintricle, If the obstruction who be partial then, the bland will only take on a velocity investly proportion as to the aiminution of area - The phenomena afforded by a bystune around a linea offend no proof of conjection laking place from 92 the obstruction of the laye brunks, for here 000 the heart continues to be supplied from other sources, and ear therefore jurnish ah the arliver for the conjustion in the int no argument against the power of the heart

posson son son son son some superiore seathered in alone steen sind on they sind of deprechit and majories, of the arrides Colout stappour dy and goden of the was as price of when blogs the their they at valuable some fort oton y to the the total weeks the states and be sing pounds, but the find object of mit subtraction from front so book suggesting the same des grating the same of stafestition justes from of Austra from stops and for of Modisine Under these impressions it has always appeared to he to be a disirable object in an the intraductory bestures nather to inquine into Those subjects of aun and that my inver ala patience in framing on the patience in framing conjectures on the one gin of medicine, or repeating quotation. of history long somee established, and every

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where the be found. But busians the actuallage probably resulting from such a plain of procee dura. There is an other heason with me not less influential. You know that I propose to read to you the lectures of another. and the constantly in the proches of offering remarks on those parts that seems As mequine further elucitation, and of quard ing my pupily against more from what ap= part doublful in its nature or authority. State my office preducer me from the opportunity and the pedom of offering any extended bieves of my awns. - I am happy therfore to en trace the accasion how occurring before you, to communicate the result of my en: animies on the subject I have satisfied for the present between. It was my intention to give you at this time the right of some observations and se Shations I have made on the Pulse, and

and the art the actions The last the work of the second eap and there is an other than the series of Harman and the second of the s Janes of the party of the state of the Pul The best of the second of the The state of the s dese geree further chance ait s. The knowleage of many of the sale of Tha is my officer for all the post of the office of The state of the s my amount of the second of the second Pal A CENTER WAS A STANFALL OF STANFALL

to apply the tenantidge thurstacquired to the explination of some of the phenomena, and te the euse of disease. But you are aware that the judicious forms and mades of the Pulse, properly so ealled, one functions of the diseased Sanguiferaux system - and since the diseased functions of this system are only that the healthy action of this system, on as it is commany called the circulations of the thos shared form the basis of an enquiney into The nature and courses of the diseased Pulsa. - I will therefore refer the consederation of the Pulse as a symptom of diseases, with The intention of laying before those of you. who may attend the practice of the Phila Ums house, the ideas and facts I may pos Safs on this subject, either in the form of a between, or in the more useful and impressive

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made of instruction and demonstration at the hedside of the patient, of that institution. I chase now unotabele the in quirey into the physiology of the bloodsepels neone particularly of that part which se gonar the motion or circulation of the blood, as it is from some original and peculian views of this subject, that I shall here after deduce the causes and en plination of some of the phenomena of the The mation of the blood in the human body is carried on this a series of parts and which have together been outed The sanguistrans System. There parts and whole the they popul in common the function of trang metting the blood in a kind of concle of motion, have at the same time structury and actions obviously

dist 27 con ban tak be to af 1. Tur tues to hen the it,

are the Shart, the arteries, the capillaris and the wins. The heart is a museular organ of four communicating compartments, having the pawer of alternate contraction and deli tation, and funished with babies so placed between its chambers as to all and a progress af the blood only in one forward directions. Two of these chambers are called auxiely and two bentriety. The wentrede by its strong con tractite force propels the blood into the en hemities of the tuber that arise from it, whilst The auricles being at the same moment de Lated and filled as a receiver by the blood heterning from those extremelies, is prepared by ets contraction te fill the ventricle now emplied and ditating. Thus by an atternate action of the auxiele and bentricle is the Circulation continually carried on From

This 明正 福水道江道于村庄 bers the disast suff time hen long the second of the second of the ans interest my the all wins on place you Alex out the county and down to the asn There chan bery and college that ofn pla m ant The c ing

This wiew it appears that one curricle and benticele placed in a part of the circuit of the bloods path two the bady, would be sufficient apparatus for effecting the con timual cerculation, - and that a perfect heart required no more than there two divisions Why there has the human heart four! to answer this question, it is necepting to remark that before the blood is fet to be be conveyed as noureshment to the body by this single heat of one ausiele una untriele. it munt in some places pout with some of its components, and in others receive some new princeple from with out - Thus the blood coming in contact with The external surface of the body and inflow ing the kidneys, thous of the perspiration and wrines - But the separations in there cares being made from a comparatively small for tion of the extreme uppels, perhaps not their hundre the part, the circulation throthere is treme upoly is easily carried on by this single

in it ippears that one decortee and the ele- place of the consume bloom for the the last work of the of 1 ate affecting for efficiency that can concerlations - concertation The cipi Man discourse harding for the format of the pan the person it is not expensed to property and time to response the black of his to be de de des manifes Hear dominated the the last of the surprise 5 mi went and the eden of the man to see when Dank town the Some of all of comments with the want week and the pos alanie de comença de con la c

heart, without the aire of any new function or force. - But it is different in the case of the bladd receiving a new princeple from without, It is a condition of the corculation that the blood shall becieve some new from ciple from the air, and not only that a small part, but that the whole map shall in a giver time he subjected to its influences. This maynines Heat the blood be sent this an infinite number of small uple speace on the our cells of the lungs. From this extensive surface of prictions a resistance is created, not much life than that which arrisg from the bland sent through the body by the single heart. - hence then the necessity of a second an siele and wentriele or of an other least to cany on this second einculations - It may be leteresting to paint out the wire seamony of thein being thun joined together. In a single he art as we have been considering it, the ven treete was supposed to neturn the blood to its

to with a colonial of the action of a colonial property and the color of the deal of A. Cus consider a the con the of from the day on a real property lest thet the wilder on a property of the cur Jou. The water was a sell agency to make my the sell of =cti the open on the sea entry out the ber aus the and the second of the second 8 phy.

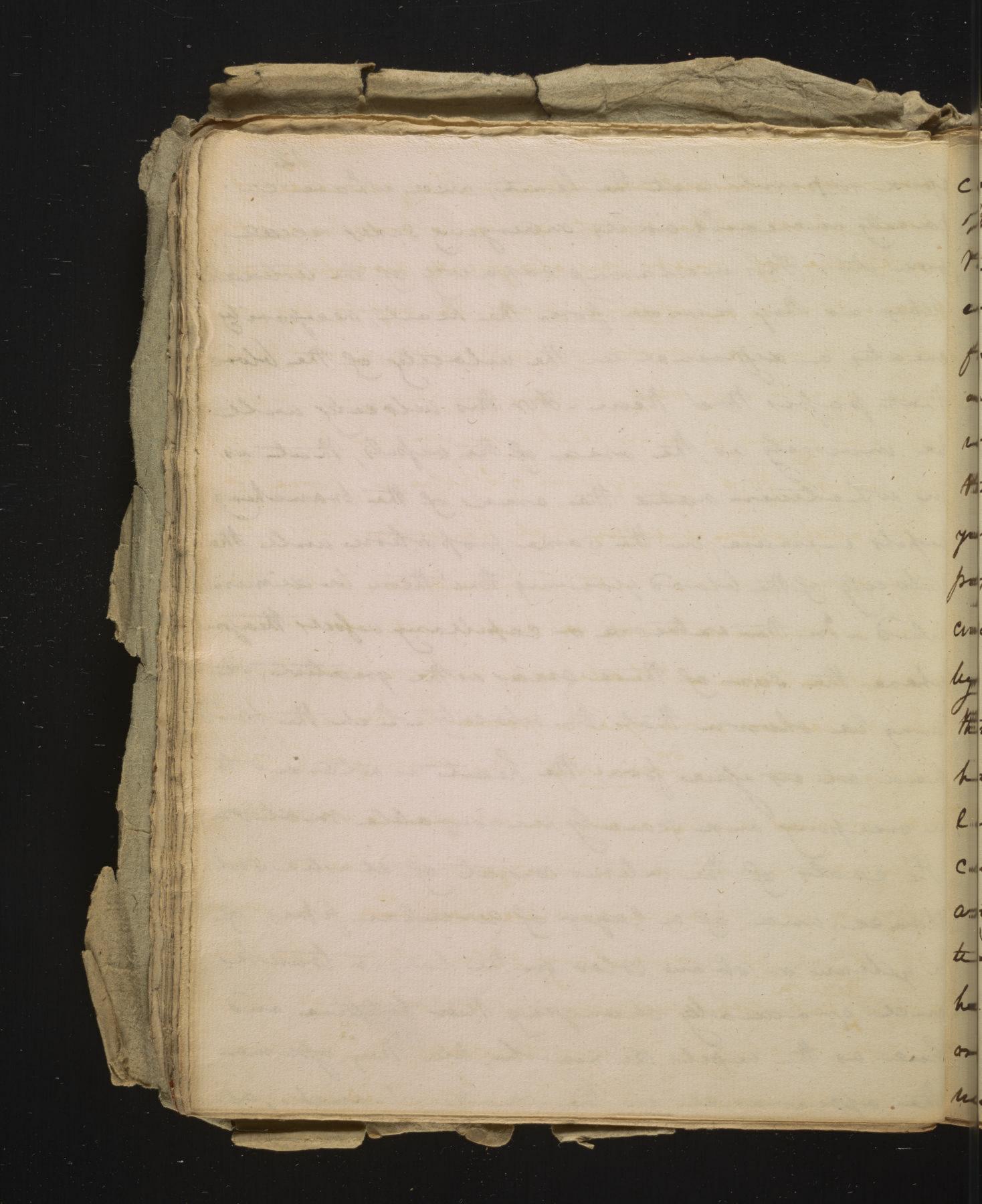
own auriele, hence if this were done by both The hearts, there could be no community in the circulations of the bods. But it is needs my that the blood sent out for the nourishment of the body should be the same that has been sal = jested to the influence of the air by the other circulation. They are then wisely and beautifully joined, by countinch anging as it were, the fun : ctions of the two organs, That is by making the besticle of one heart neturn its blood to the auricle of the other. -It has sometimes been made a question among physiologists conserning the motion of the heart. Whether its actitation to an active or purpoused the ventgiles weller an them it has en etters an whereat power of expanding, after contraction or wetter this enpansion is produced by the me: chanical effect of the blood pres'd into it by The contraction of the auricle. To me it sums extraordinary that in there latter ages of Thy

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Gology a doubt should wint, since the con terucause of motion in the heart when sepa vates from the body and uply of some animals experimentally aumoustrates that the bentuete is detated by a power veriaing en etself. The second part of the circulating structure is the actives. They are tubes arrising from The ventriely of the heart. That run into di busions and suledivisions, tete they are distribu ted in their first or Capillary branches, Modat the whole body . - Hear be ohawn that the aggre gate areas of the subdivisions of any one branch of an acting is much greater that the single once of the Section of that branch, and consequently that the sum of the areas of a trensuence section of all the capillaries on cotreme branches of the arteries, munt be greater than that of the sin gle tarlinial tube as it have the heart. The anteris therefore in their form have have been said to rescribble a tree whome, springing from the Least, and in their contents, a cone whose

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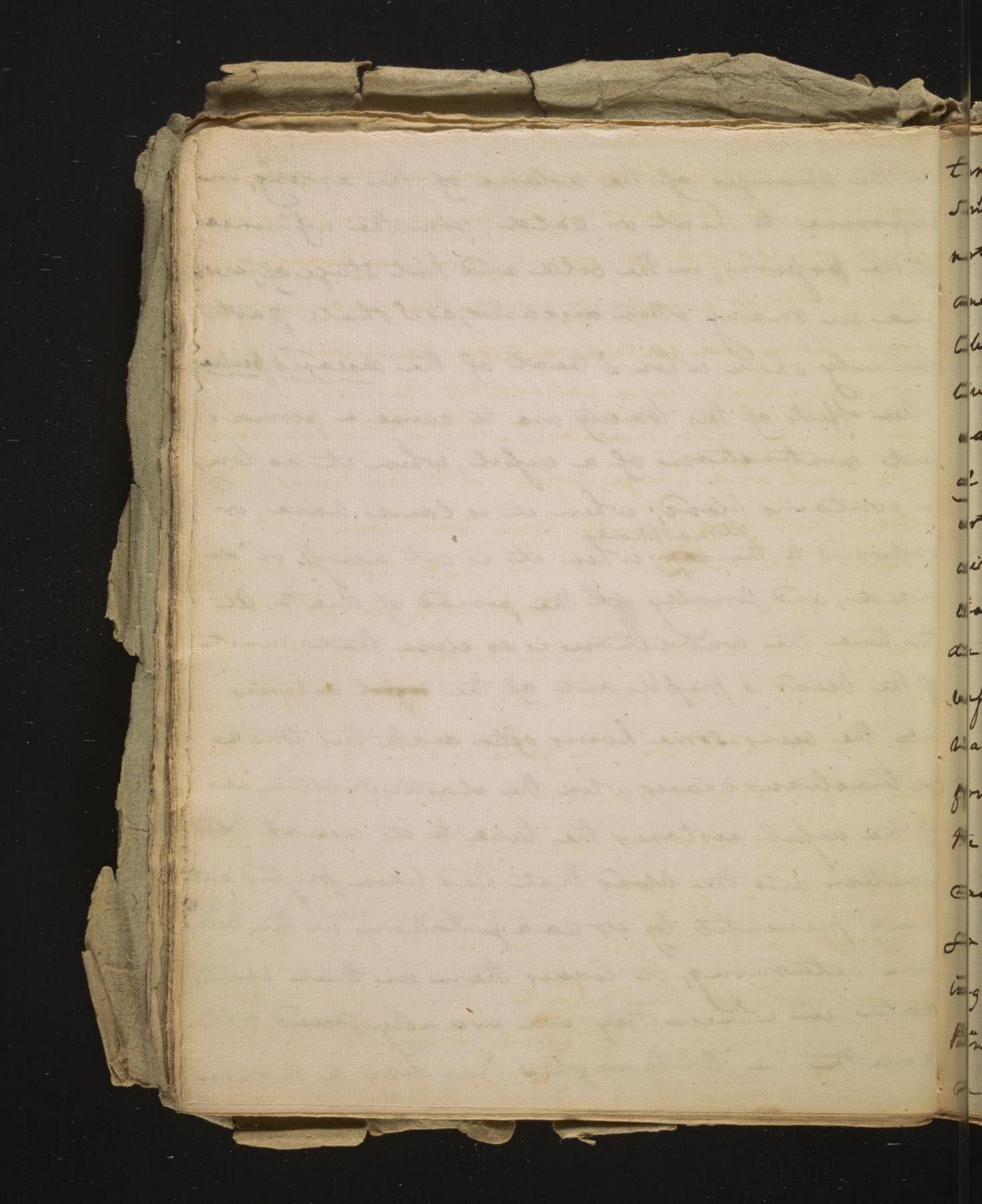
aprese or paint is at the heart, and whose cu: pacity increased as its oiverging sides recide from it - This mereasing capacity of the arterial tuber as they rece are from the heart, necessarily creates a deference in the velocity of the blood that paper theo them - For this welocity will he inversely as the area of the vefsels, that is in whatever ratio the areas of the branching befols enere are, in the same proportion will the relocity of the blood flowing that them be dimin whid - In the extreme or capillary unfolly theafore where the sum of these one as is the greatest, It may be shown that the belocity which the blood had at its ifme from the heart is netarded to a creeping and scarcely measurable mation The casts of the arteris consint of clastic sub: Stance, and of a layer of circular fibres, of a yellow or straw color in the larger tranks and gradually changing their testure and hue as the uppels dimenish, the they assume the appearance in the smaller branches, of



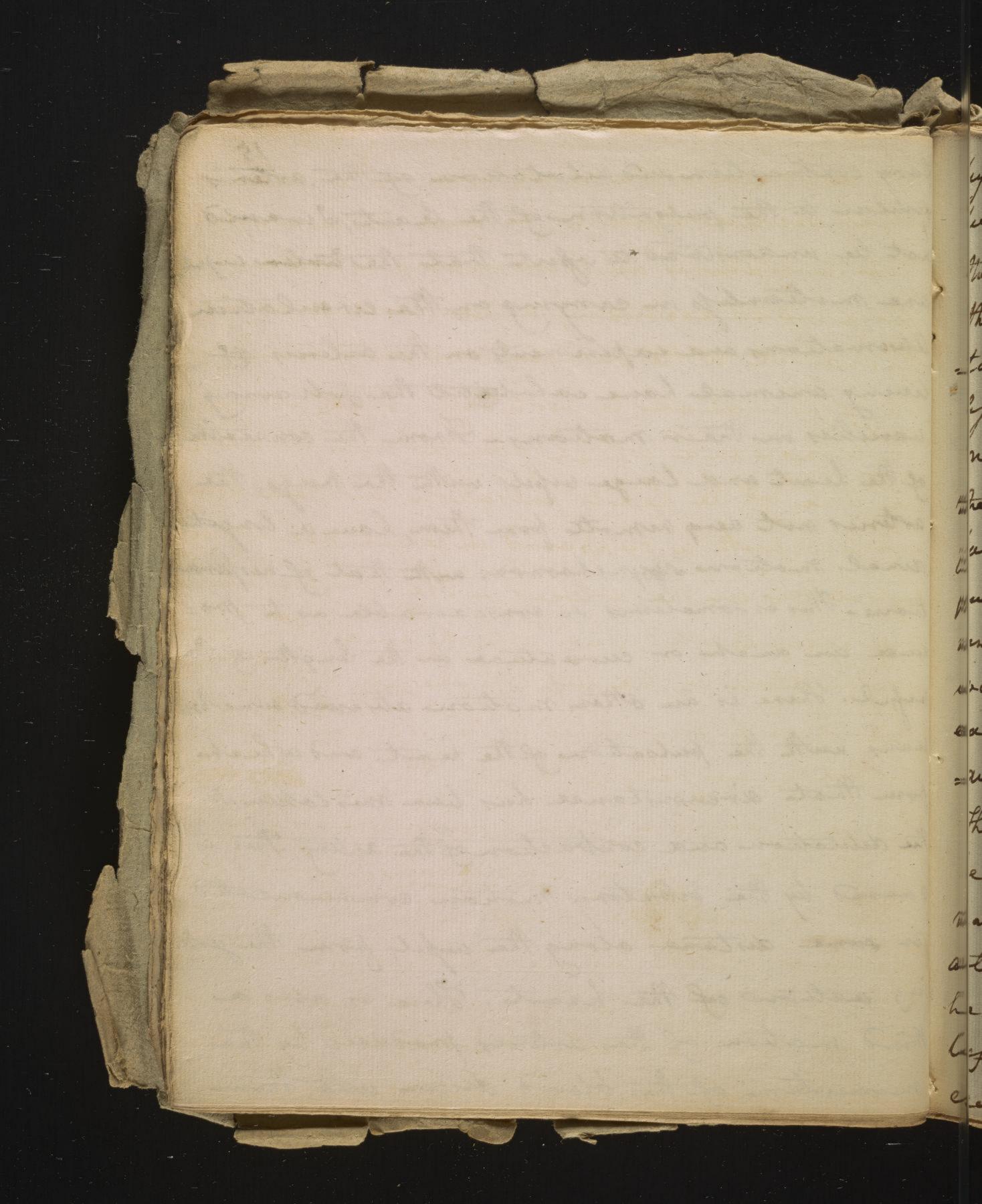
common muscular files - The presence of There fibres in the coat of the arteris hus been The cause of much phisiologicale discussion and error - as it was infered that the uspils derived from them the paneer of alternate delitation and contraction similar to the heart, and which served to aid that ongan in propolling the blood this the system - I hope to prove to your satisfaction beneafter that the arteries as not populo such pawer; that if they aid populat, the aveulation would not be aided, but abstructed by its operation - I shall only remark here that there musculeur fibres give a power to the uppels wh has been called Tonicity. This tonicity or museu lar produces in the suply the following effects. It causes a variation in the size or toolume of the artery, by its increase or dierease, but this varia tran is not of momentary atternation like the he arts, but continues in its state of enlargement or contraction for hours ways and even muses ausation. This variation is exhibited

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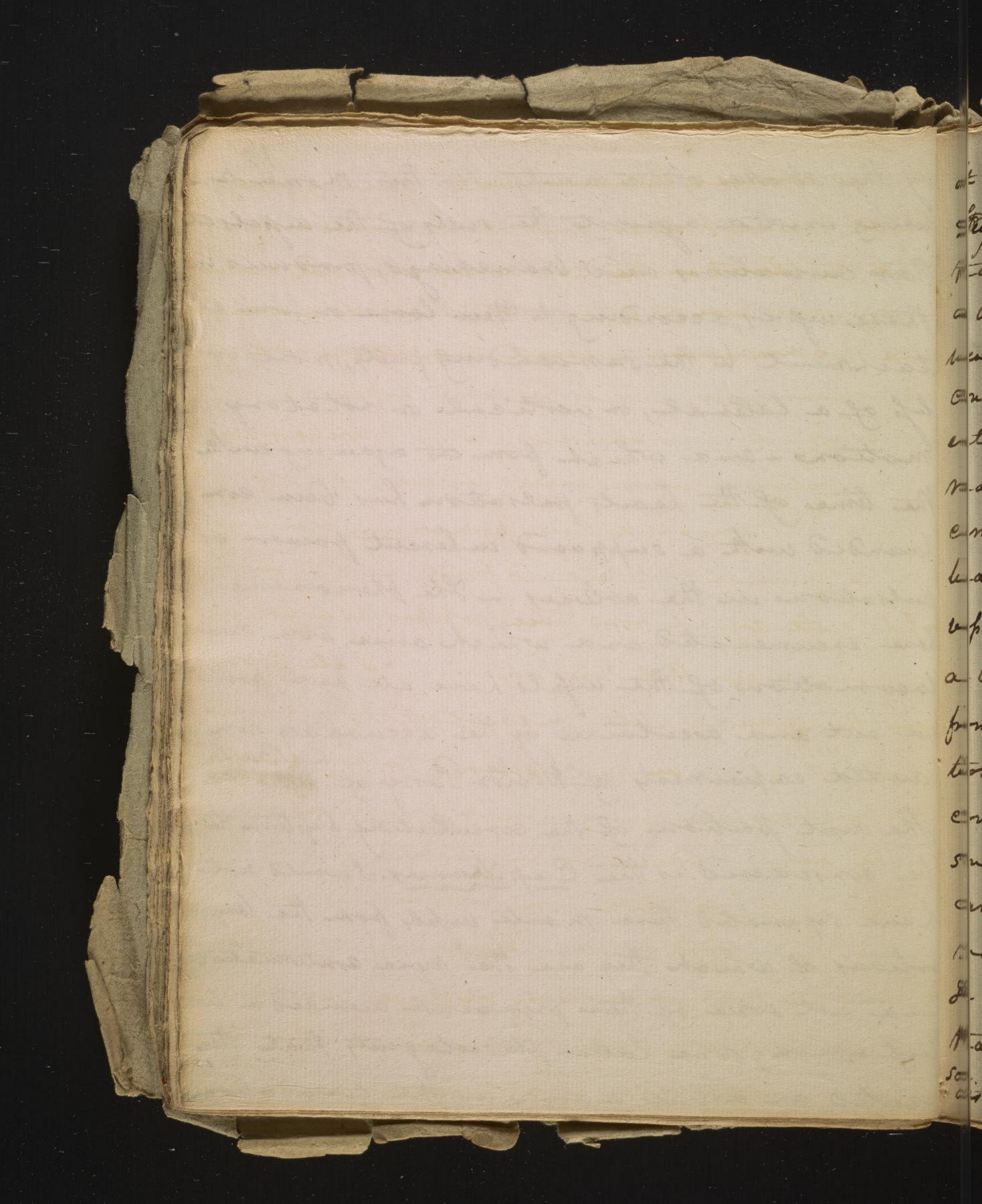
in the changes of the volume of the artery, on exposure to heat or cald, from the influenced of the possions, in the cold and hut stuge of seven and in many other diseases, as I shall parte; cularly show when I treat of the diseased pulse. Other effects of this tonicity are to cause a perma : ment contraction of a wfiel, when it no long en contains blood, when it is laid base, or in posed to the and, when it is out across or di rided, and Sinally at the period of death. At this time the contraction is so close that most of the blood is propol out of the work arteries oute the veins - some hours often death this tone a contractions ceases, when the elastic substance of the usual nestones the tube to its usual di ameters, and the wood that had been prefor out being prevented by its caaquilation in the being from netterning, it leaves them in that empty state in which they are usually sound often anath. - although I thus dery a momen



tany contraction and dilatation of the arteris Similar to the pulsation of the Least, I would not be understood to apert that the ander wight are maticules in carrying on the cerculation. abservations and experiments on the arteries of living animal have exhibited the following varieties in their motions. I from the connection of the heart and large wifels with the mings, the arteries not very remote from them, have a longitu dinal mation sugnersonous with that of nespera tions. This is sometimes so conse acrable as to pro: duce an auch or currenture in the length of the reful. There is an other motion alrewed, sune mo wans with the pulsation of the heart and which from that sircumstance hus been mistaken for The dilitation and contraction of the arting, This is caused by the orbitory motion communicated for some distance along the uply from the jest ing actions of the heart. There is also a thind mation of the arteris produced by the momentum of the blood driver with them



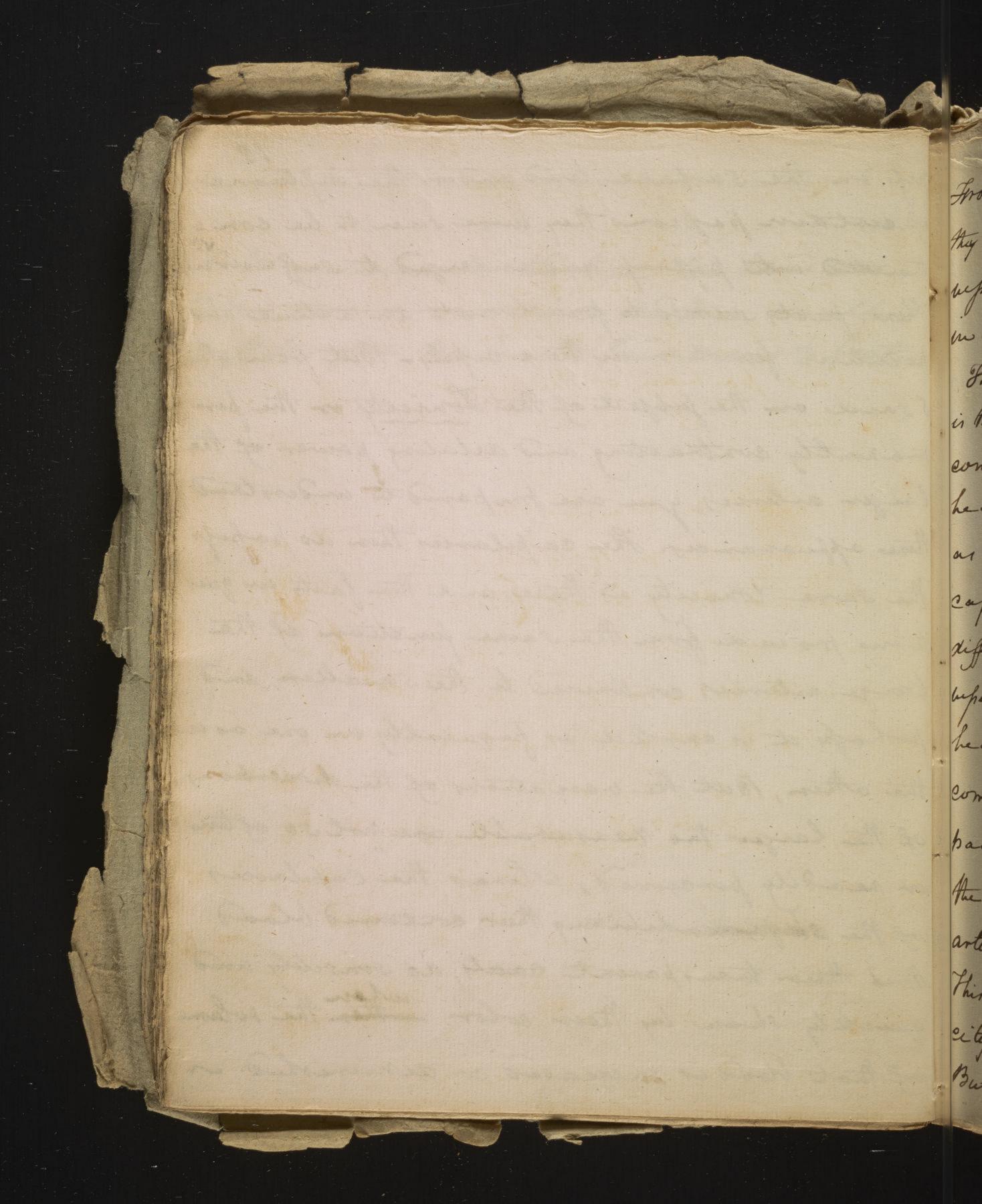
by the stroke of the heart. For this momentum being exerted against the sides of the upsels at Their curreatures and branchings, moduces in those reply according to their loose or firm at -tackment to the sumounding parts, more or les of a lateral, or vertical or rotatory motion - and which from its agreeing with The time of the hearts pulsation has been con founded with a supposed whereat power of pulsation in the artirer. - The phenomena here eneumenated, and which arise from mene locomotion of the uple, have all her point ea aut and ascertained by the accumulately cong-= audid experiments of Doctor Parry of the The resit partion of the circulating System to be considered is the Capillanies. Swall not have separated there minute uply from the larger arteris of which they are the mere continuation had not some of their phenomena induced a be lief-among some later phiscologuety that they esertes an active agency in the circulation,



It was absenced by Lewen Look, Baglive, box Hegge, Senae, Haller and other capenimenters that the blood in the capillaries aid not pursue a uniformly airest course, but that its currents were promisenancy forward and retragrade in contiguous sufely, and in the same suffer at defin ent times - it was observed too that initation made on these while coursed various and opposite currents in them - and there phenomena were assis be a to peculiar properties and functions of these smale supels, quite aixent from there proposed by artires of a larger size. But these appearances all Glow from the innumerable inasculations or connec tions that exist in the capillaries for from such a construction, any contraction or ailatation of there small sepels produced by an abstraction of their canals or by instation from without, weuld move the blood inauforently in any direction. It was further remarked of there Capilaries That he cortain cuticular diseases they were distanced with blood as to cause a usible had

of It was observed two that the blood some here times more a on ward in these small there reflect, after the heart has ceased to beat. Lecu sa time the . an burk

ness on the surface and under the influence. of certain papions they were sun to be con: trusted into palme and enlarged to suffusion. There fuets seemed to paint aut an active and peculiar function in these uspely - But from what I said on the Julyest of the Tonicity on the per manently contracting and delating power of the larger arteries, you are prepared to understand there appearances. The capilaries then do papels the same tonicity as these, and the facts we ques tran proceed from the same function of the Large arteries continued to the smaller, and purhaps it is exertise as prequently un one as in the other, But the variations of the dimensions of the larger the measurable, are not so often or readily percined, wheres the capilaries of the skipmenhiliting their evilained blood Amo their transparent coats, as sensilly and quickly show by their color withen the whome of that blood is meseased on diminished. I



From this view of the facts it appears to me that They are not admit the inference that the outillay repels proper and active and preulian agency in the mork of the circulation. The last partian of the sanguisterous system is the wins. Here like the arteries have been compared to a tree whose root is fixed in the he art. and like them too, their capacity encreany on the branches muttifly and close in with the Capilaries of the arteries. There is however some difference between them. In the small or capilary befils of the being and in the trunk near the heart, the areas are about the same with the comes ponding parts of the arteries - But the cu: pacity of the wins within those limits, exceeds The capacity of the same relative extent of the arteries in the proportion of more than two to one. This proportion expreps the relation of the cupa city of the whole of the being to that of the arteries But there are some particular parts of these

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two systems in which the ratio of the capacity of being the arteries is much greater. Thus at the bena of the arm, there are flue veing returning The blood for conveyed by a single arting whose diameter does not esceed that of any one of Those viens - The veins are provided with values! which allow the prograft of the blood in but one direction from the extremetry - They have more clas licity than arteries, hence they allow greaters destin tion and readily neturn to their usual size when that aistentian is remarred. I they also papels a Jonicity simbon to that ascribed to the arteries Tho in the veins it approves a variation in the size of the tuby, by prequently, and certainly w. les force. - That this tomicity wists in the small or capilary veins, must be infered from their exam ing to blud equally with the artists, a short time after they are divided - and its existance in the larger veins is palpable, in the variation of the size of there uepels, so Sommetly occurring in

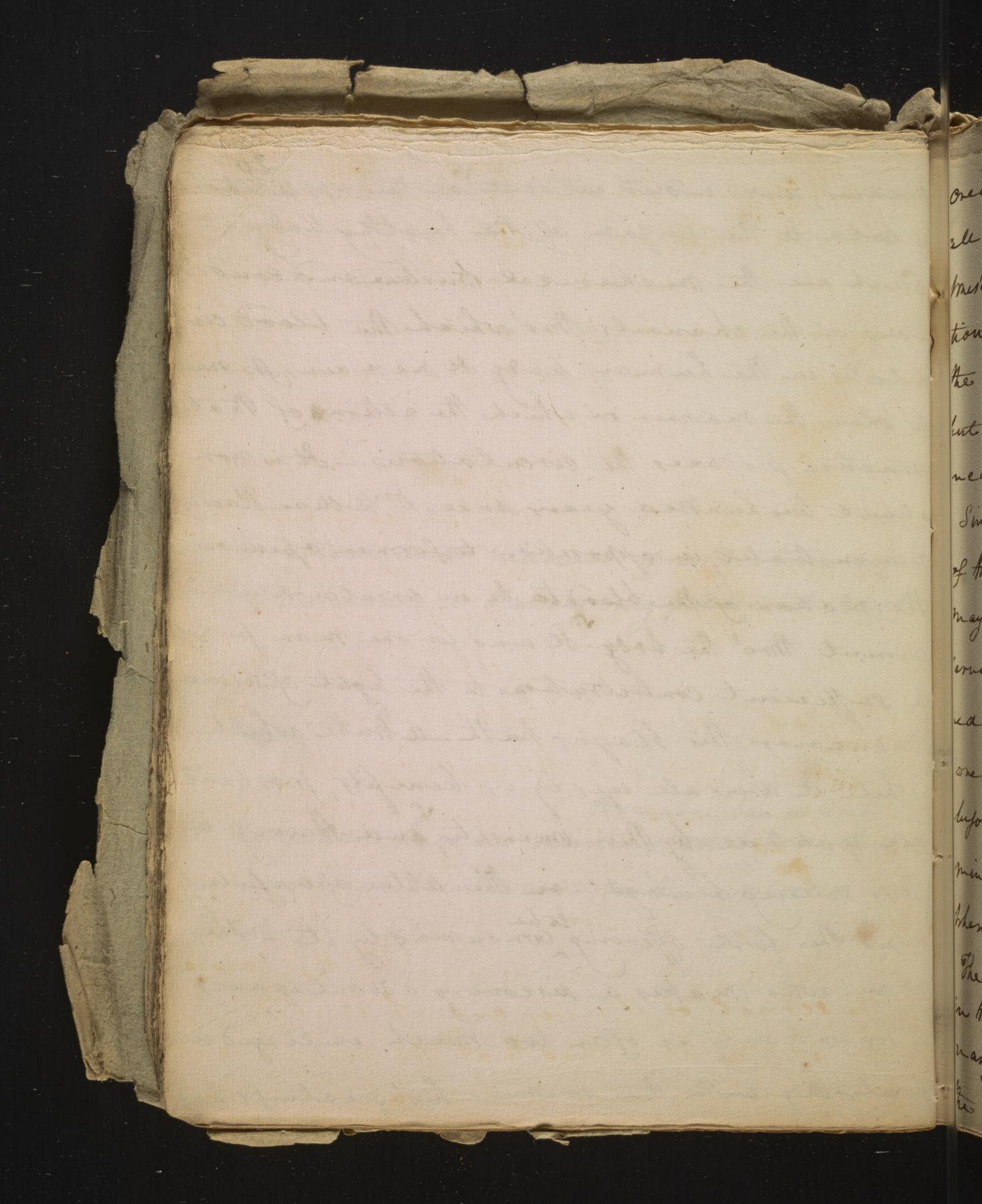
Vi from Their contraction V. The actail and manner of its motion were stile unknown for Haveny only pointed out its path. the n Janes V The greatest human sacrifices out before the world have been made for the service of man

disease, and indeed wident on the application of onla to the surface of the healthy body un Such are the mechanical tructure and could tions of the channels throwhich the blood cir outseter in the human body. It nomain, for me to show the manner on which the actions of that structure produces the circulation. - It is non about two hundred years since De Mullian Hamy demonstratio, in opposition te former opinion, The motion of the blood to be in circular returning current thro' the body. It was for one man perhops a sufficient contrebrution to the light of science to uncover this blazing truth a truth which while at drove all eyes by its benefits, prostrated ale gratelude by their mensity, and Harvey in thus setting his light on the alter of usefulness was the first offering consumed by it - The man who makes a discovery advantagaus to humamity is often two much employed in contesting with the evenies his greatings has

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orealed to have the full prospect and to make all the applications of his truth and Harry presa into the impotence of poverty, by perse ece tion-was abliques to leave to his succeptors the completion of a work he had undertaken but which he had not the means or times or eneaunagement te fulfile I mee the time of Harvey deferent explinations of the arculation have been proposed, and it may seem strange that a subject so open to ob: Servation and enfoisiment, shawed yet he obser hed by difference and doubt. - I shall mention one or two of them, with the objection, against them before propasing that which has arrisen in my minds for an induction from the structure and Thenomena of the sangue firous system in The first opinion on the circulation that arose in the school of Havey, and which is held by many at this time, was that the contaction of The left ventuele, descharged about two sunces

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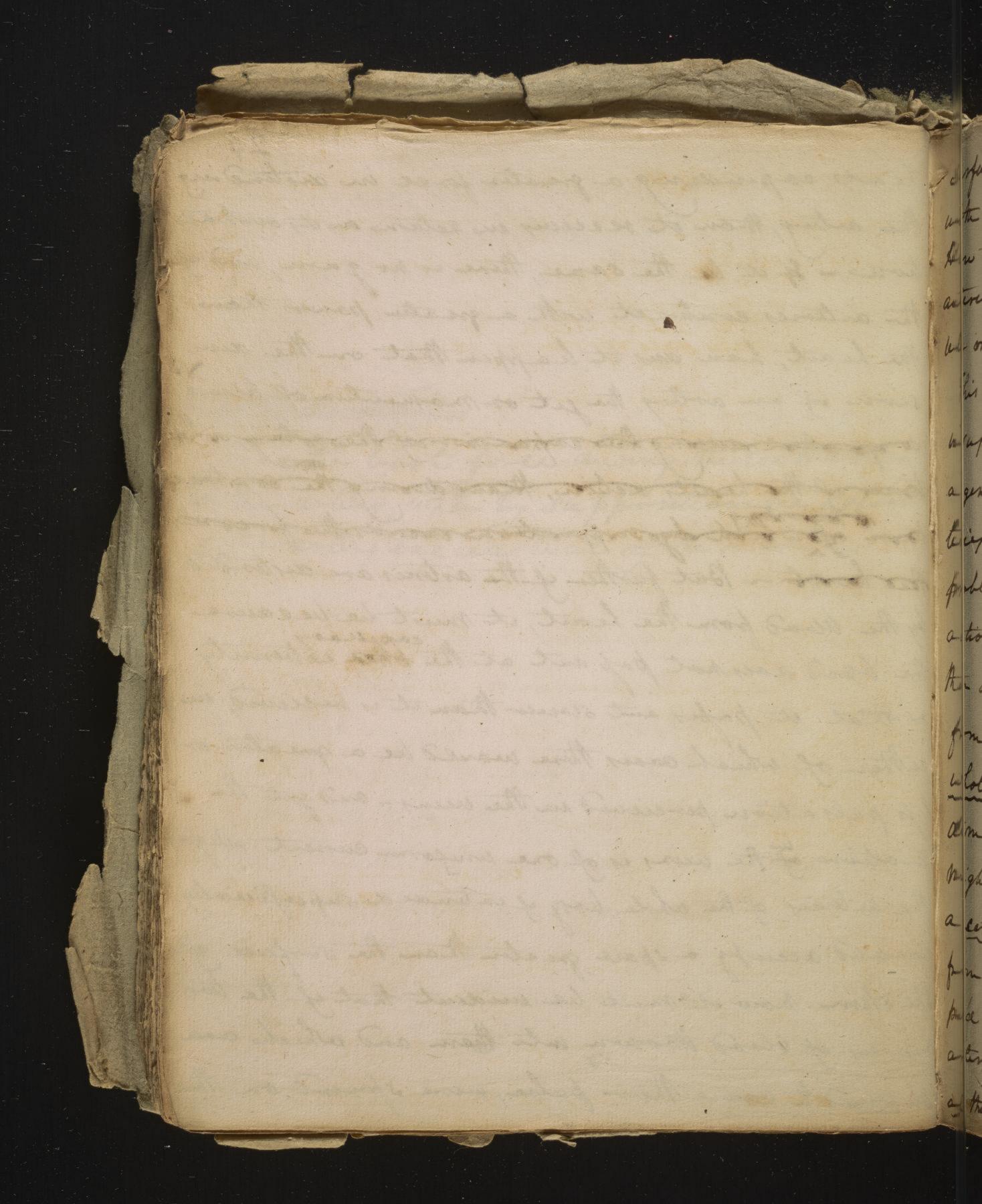
of blood into the arting. The assition of this quantity to vefuly already fills, caused a ditatation of Their sides throant the whole artiral system, In the succeeding moment when the heart began to de late the arteries being no longer prepar by the en trance of blood, regan in their turn to contract and the values at the heart preventing its return into that ong an it was driven forward into the ming, and thus by the atternate stroke of heart and artery, the motion mas affective in this first section of the cerculating system. - according to this opinion it was continued in the wing, by the force of the ar living be hind, by an absorbing or suctions power in the capillary viens, by a slight contraction of the veny themselves, and by the prepure of muscles upon them . - there was maced some plaurability in thes solution considered as an early trial of enquire The sursakan of a shack on prefing an artery, be mg such as might arise from its sunden enlarge ment, the visible motion of superficial refuls, and The supposed necepity of an aid to the heart, to

am mes the season of the same of 1 ile 'tin an There by the alternate the he has of he as the the Markey was a special for the first the. Pet 1 ey are abjectioned on secretarion las 力林 Ma time the ! a cheese on many the first warmen and the said tal accolden marcian all safes for for tun

overcome the mustances of the blood, were car: tainly facts that might have led without much reproach of reasoning to the false induction Sounded upon them. - This explination however ville be found madmipible, on a close observation and companies on of the phenomena of the Circutation It is a formed on this wiew that the heart alone cannot over come the sentance of the while to the blood, and lines the neighty of the puly above of the activity - Withaut negetting this as more hypotheris Ste may be asked if there is any gain to the heart he Thus adding to the resistance of the weight of the blood and its pistion on the upply, in odding I say to there, the further resistance of distinaing the strong clastice can't of the upily this and their weder ex tended surface - But asmitting even this, and that the artery after being distended contracts upon it, as cumulatide contents it is plain the force with which it contracts must be left than the heart or it muit be be the same crit muit be grea turn. - If it is life there is a pasetime lop, by the

a servetan and of the blood of week es the the straight have been been to the the the the state of the party of the p on VI LI HAR MANTE of the arting exceed that of the heart. ATA be asked of them to any poor to the see to the have a strong the than according out that were gother to 71 - 64 the principle of the forth of the me was the principle of of the he per the hope hope to disting the the " there say a company of a specification as any - Motio when words with meaning the second that second with

heart expinding a greater force in distinding the arting, thou it receives in return and our has twow - 4 it be the same, there is no gain, and of the artiries evaluate with a greater power than the heart, have durit happen that on the divi sion of an arting, the jet or mamentum of black as quality the expansion of the souther, or the toward the heart, action, than dowing the construct down of a bish oby sorpposet in concentration for the Aut but at further if the arteries are duter ded by the blowd from the heart, it must be because the blood does not pap out at the the extremity or that it paper aut slower than it is believed, in either of which cases there would be a queater or les puls ation percieved in the viens - and yet the mation of the views is of one uniform current. Again The arteries of the whole body if intended superficially www. accompy a space greater than the surface of The stem. how it must be wident that if the two owner of blood, thrown into them and which are supposed to course their pulse, were spread on this



Surface, it would not cover a fourth part of it with a strutum of the least measurable Threthy Have them could the true across when thrown with the actives and operand through them produce a sense ble or effecte al potention in them. This last objection having hear admitted as an insuperable argument against the doctrice of a general ailitation and contraction of the an teries, an other attempt was made to salve the problem of the circulation by considering the action of the artery as partial, Some phisologests then acknowledging that the two suncer projected from the heart, was not sufficient to distind the whole of the arterial system at once, to any suisible dimension - aperted that this quantity of two anney might produce the requesite enlargement thrount a certain estint of the arting, suppose twelver inches from the heart, this portion then contracting, pro: pla part of its contents, into a second portion of the arting of a cirtain estent, and thus by a succession of there pulsations of timited portions of the

Fistanas in a lugical point of view-

arteries continued to the extremetic of the Enfilaries the blood being alistructed by the values at the heart from returning was carried formeands to The viens -It was in short making there succepies portions of the artery, so many colinarieal hearts, only having no walney between them to want from the contant to the total of the surgening from thompower to the state the state of the stat was started the one of the arterior reacting at the tomat of over a such a transfer of In reviewing this rationale of the arcutation of med searely tett the younget of you that it allugather an hypothesis, for what absenvation has marked and induced could mark the motions on which it is graunded - It may pulaps be se garded as merely one of those schemes, so common in seince for the avelopement of subjects on which knowledge is bothe distrable and defi cient. - The first on the and son to the son for son son

So It is a prumed in this theory that white the wenticle is contracting the first portion of the aorta is dilating to recieve the injectia blood. Whilst the wenticle is in the pause of its detatation this first portion is contracting and the second portion of the aorta is alating to recion the blood prefer on by the first portion, so that

estates in no afformes to former they are the first for if the aibilation of the successive pations of the astering the beget to the estrementos to all made mother souste post of time, a which the left own by considery Knowled the trusposition the eyes or based to dis targuist rangy mioney in the time of there succession motions - the photo works promotostage and distillation of the over the services on there example the board of the board monago but even as an hypothesis it will be easy to show that the operation of the proposed seteme muned produce effect, very differtul from the real pheromena of the circulation to left ar extincaries to the shore siar are ong to song look be feller with a found, and an worth on the good tilg of fayor to proper into one englisher same appearant unitage on aquite quality with flow from the other ostronety whatever be the lingths of the later- for some the ast mother greating own space of order by the work and by the work but he

the ventricle and the second posterie are g gpc hothe indelation at the same time, whelst Qu D The first portion and the third are contracting DE ON at the same time - and as this alternate action of is continued to the end of the arteries, the promy rais greprion of the ood numbers of these sections the you will be in a state of belatation, at the time beton The progression of the even numbers are in a State of contraction, any trac of contiguous por of wine trong weile therefore in their actions, resemble the agrade allemate action of the auxiele and wentred of the of the heart. - Since therefore there is as much of 400 the whole entent of supply in the state of contract to of tion as the house, it is impossible three could to be that universal sunchronaus stroke that is felt in the actoring . - But further there is The same a fact on the subject of this sunch ronaus Throke that painty out more precisely the when impossibility of such a succession of action in the artery as the theory supposes . - It has been shawn by the detail of this theory

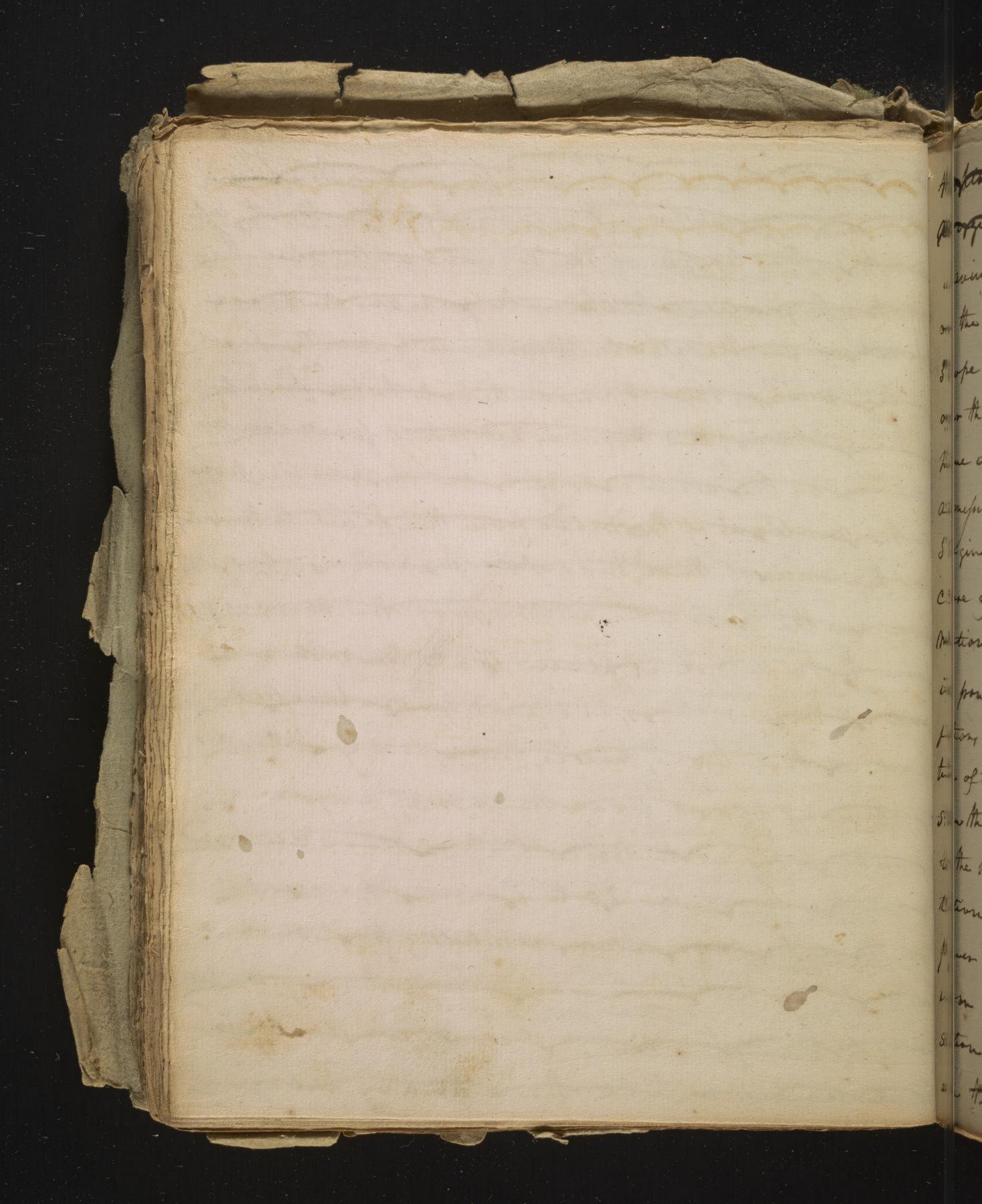
It appears the wayon of the posseless quante in the elet case of the some have gothand another of an armed segron some by the petosity of the fint forget by cityen energe or a commo inthe com no. parciention, it follows that the westy of the two quality most by equal, an asthe same will the brue of all the intermediate quantity of fine for if st were to therwise, there would be a comprise por of thise intermediate quantities on a delication of the the after des, which try the seon with my of the proposite cet on assimpositions - the sactority and space difere hoy was afthe whole they will be man by the the betorety and space of the val metter flunguartily The motion of fluid or of its and tagares to the mo at how of solar, i dealers the smotion of the solar col 4 from of thing, he gan of in them there is my al tration of the stating porofer of partight, but tu appointe mation of the whole. But the cong etu in augranut with fluides florosing thoro et gester types has for hire if the registance to the directarge the greater Han the resistance of the clarking of the toley y there dute the distinction on the asmission of any hours

That when any one of these limited portions of the artery is in a state of contraction and propelling you it contained blood, the next portion in advance " is at the same time allating to receive it, as " They then exactly resemble both in the mode I'm of their mation and their effect the auxiele on benfriele of the heart, we may take the termy of wh of arricle and bentricle as convertible with Thore of any two portions of the artery, so that the the whole of the actival course will represent and alimate series of auriely and wentirely - Recolled to however that I make this substitution of termy & and this analogy only to afford an easier compre by hersion of the argument. - now suppose tim au pton sieles and ten ventrieles thus alternately continuon to on by the contraction of the first vertice count neach the tenth, tile it has succeptually undergone the contraction of the eight informediate heart and oly, that is the blood cannot neach the test with better bentile, untile the time occupied by right a the

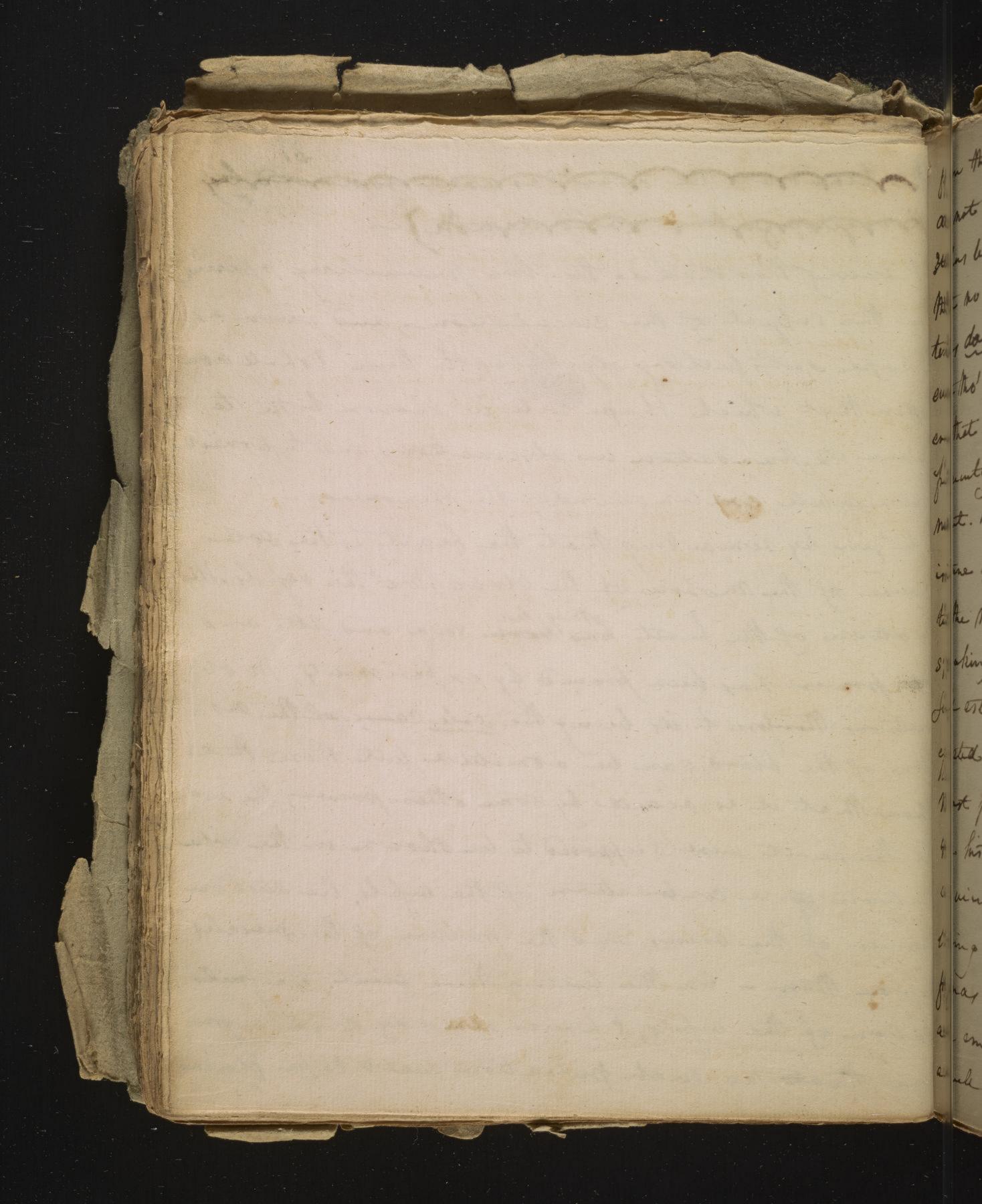
the quality of place, the space in quent qual to the lay by that secure gand organic hange will take nee place and they the mostion with set be of the solid as column but of the particly comparing that, columna as whom betations position with he changed by lateral lea gra of motion to the your ding and the my of the tyles - now to spiry the the hyprothers the before up to her the langet projects its two survey of blood the hoto the first portion of the Rosta which we have an get of tweeter tracky the side of the orfite are deten olle got by a spood copatie of containing this additional y quantity, and how is descharged from it and more you bened from the heart, when the extraction of the an portions of the dupic or quantity equal to that addi men tonal buth racionalitanschange from the one re not prote from the heart, into the second porture or see who and their the is concern the a with surrefrige section of the syntheman air monthing in boy the to as the seins For as it is the quality of bood thrown into one of these seations

Successive contractions vill home elapsid - 4th and the same will happen if there showed to be a pause of the first bentriele, and no bland should be cast out. - That pause or that by sicioney of blows well not be fett by the mother tenth bentingle tite the time of all the interme to diste ones has elapsed. - If instead of the texthe The sisth be taken it is evident that the time in which the pause unle be porecioned in it out be life - so that it is impossible that the pause of can be fett at the same time in any two after ent bentriety. - how in the circulation of the p-A blus the heart occasionally suffers such a 9-19 pause as we have been supposing, on such accusions I have proved with the side of an of sirtant, as any of you may prome by like objut hation, that the pause is fett in all distancy to the of the artirity, in the Carotia, at the anche and at the wrist, at the same instant of time - of the a theory then fore that contradicts a manifest to phenomenon of the circulation cannot be tree to

2. Heats actions its lingth, it follows that in ed the expilences, where the quantity is the beauty api bling the langth of the section will also be - What of grater, which will give an ammers monther in the whole with only the section, and they may be proved for more much of the protion of the blood from the heart to the being for the heart to the being the heart to the being the heart of the driver of the discovery of the trong of the trong of the two query the heart of the tring of the trong of the two query the heart of the two query the transfer of the transfer from Age he auto, it it plain that the motion of ch que of there sections is effecte in or houstiches of best of the time, the welicity of the dis the charger of bear from the enough anyone of my Have sextens into the hybridge blood according an four Age to 20 to 18 But who done not - See that the montain wrating from such a at waterity of the flower to be without of the forest the time of the system when it is so as it willy found Mutotauble on treble the ardinary mothogon of



Hoperan the Sant transforming disopprosporter sono and -I sveng their stated the two prevailing opening on the subject of the circulation, and queen as I hope satisfactory objections to them, I shall non offer that which I hape will be shown both to have its foundation in observation, and to former admissible explinations of the phenomenas. -I begin by remarking that the heart is the sole cause of the motion of the blood thro the befuly. His motion of the heart hours been sun and fett, and its power has been proved by expaniments, no ob: jection, Therefore to its being the sale cause of the motion of the blood, can be admitted but those that show that it is aided by some other power, The side to the he art were supposed to be shown in the dila tation and contraction of the whole, the suction power of the veins, and the prepure of the musely upon them - on the first of there points, the pul sation of the upply, I have already shown a pri one that no such pulsation caned take place



from the operation of its supposed caused, But & do not wish my argument should but on this alone. It has been proved by observations and capin ment that no such ditatation and contaction of the an tening day esist. - It have been admitted by Haller even the le assenber the pulse to the dititation of the art eng, that the inspection of the artistion of living animals pequently ashibited no sign of their alternate more ment. Birehat afterwards denied altogether the ax istance of this ditatation and as cribes the pulsa to the motion of the whole arting, or what I caled in speaking of the arteries, their locamotions. - 13 ut the full establishment of this opinions has bally been exected by botton Parry of Bath by a series of the most precise enfusiments. - Doctor Parry has given The Instory of 27. different caprimenty made with a vine to discover the functions of arteries in living animals. In there aposted by his medical primas he exposed, different wefets, and the they ale employed the most alcentive absorbations as well as with some modes of mechanical

mi ciuse de eta we s pe by ly a an will areas they the perfect the the sketchister lu see the Eth Cajin delina utin co fu tong. bu whele e beri Vi analagies in mature are not manting, to warm ween no of the problematical nature of this apun phowwhich seems to be graunded soly on the idea of The neighty of and universality of attraction, - The appearant repulsion or at least the want of attraction between water and the leavery of some may the polished cost of the arting be mother of there

measurement, they were unable to acted the hast dilatation or contraction of the artery. - Here was no acception here from the exposure of the whels, as the pulse was felt on pressing the before as sensebly as before it mas laice bare. -The see then no possible foundation for the apinion that the arteries offerd any aid to the heart in carrying on the circulations. The idea of aid king desina from capilling attraction in the wins, or as it is call a thin suction power, is equally unsales factory. In the first place as it is said to take place in while too minute to be the subject of observation or experiment, the existance of this capillary attraction between the internal coats of veins and the blood is sulinely an openintion. - But allowing its existance it is easy to see it must be an obstruction to the an absurdity be apune a a, a course of its progres. with negar a to any aid from the musely of the their prefuse on the very during their action, & would only objetuc, that this cause if it were

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Vi Thus if a cylindrical tube whose sides are unyilding be filed with an moonpropible will fluid, and an additional quantity be prefer to into one end, at the same appearant in:

effectual could be so only accasionally, and therefore disover no conscaration, in an enquiry after the continual causes of the circulation. as no cause can be shown to afford aid to the heart, it remain, for this organ alone to carry or The circulation, The sufficiency of its power of hope to make manifest in as the action of the heart is excited on producing motion in a flivid, it will be meafoary for the un a law directanding of what I active, to explain to you the tomes of moving fluids. - There of from their consesting of partiely easily moveable among one unother, and possing lettle mulual cohesion are capable of two Kinas of Motion, the one a motion of their whole Moss In consmon with solid bodies, the other a betration or unautation of the parlicity themselver, communica to a sneedfully from one to the other throand the whole majo. The form bold the tertically wood from a finior ineat the upper one it wite quetly took that and be discharged at the other, here then is at motion and sompthe order the whole the of

1. tig stant an equal quantity will flow from he walve the other extremity. For since the admitted to reg quantity cannot enter, but by the space offerded by the discharge of an equal bulk of war it is plain the admitted quantity, is the tim of the course of the motion of that discharged, and as tin of no reason can be shown why the velocity of the first should be either mereased or die menerted auring its communication, if follows And the velocities of the two quantities must be in for equal, and the same will be true of all the it the intermediate quantities, for if it were other winth were there would be a compression of the to wi the or a delatation of the oylender, which brown by the conditions of the proportion is impossible of na This motion as it is analogous to the motion formy of solid hodies, is called the motion of the Milaon solid or continuous column of flux -

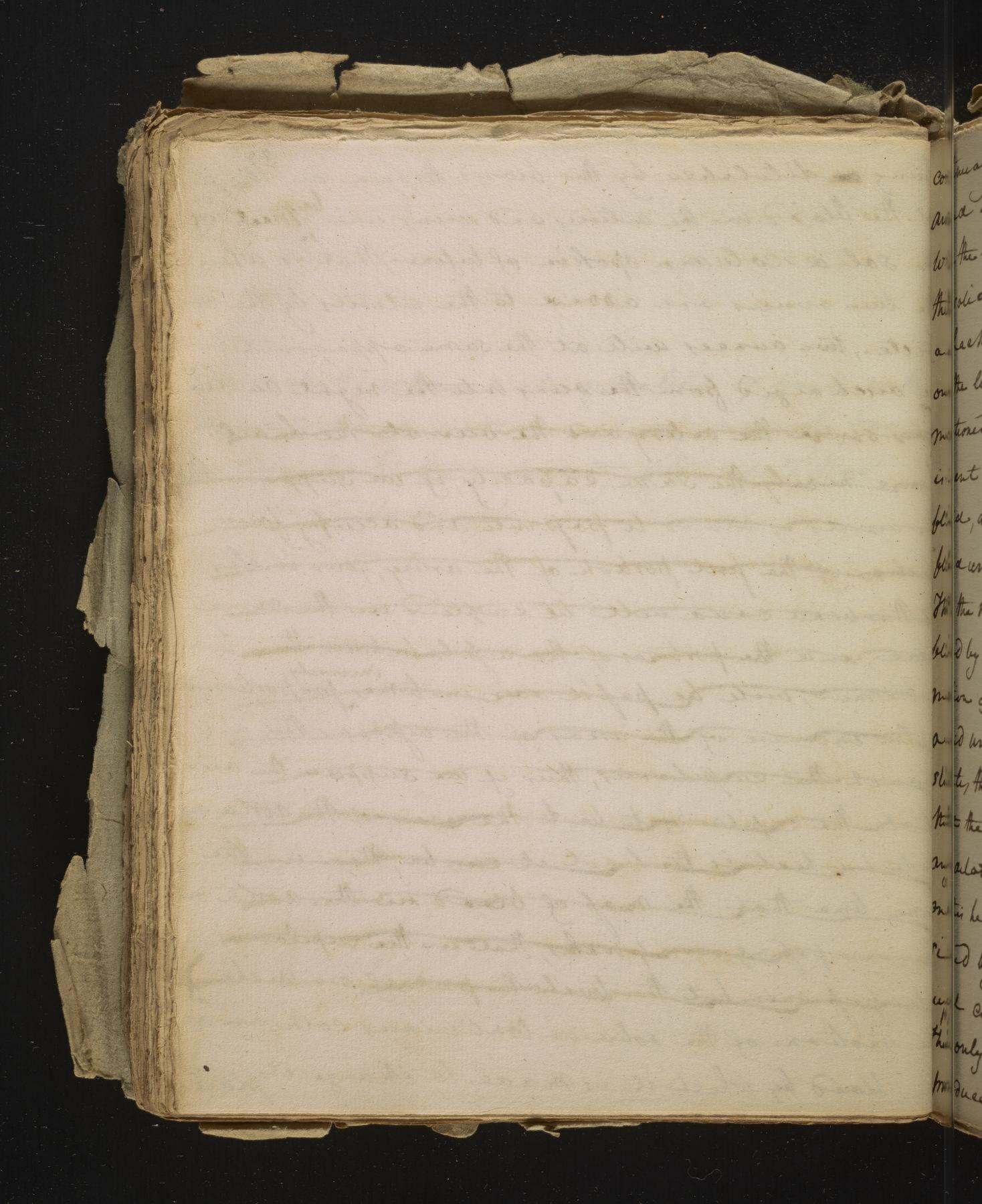
But if the same tube be filed, and each end be covered with a piece of leather, a blow or shock given to one of there pieces of leather, will be felt in the some ek appearant instant, by the finger applied to the other. none this ex hibits and illustrates the outration or undulu tun of the parlicles of the fluid, for in matity each par tiele of the fluid does go forward and neturn thro' an infinitely somale space, and this betration heing con: linue a on te the end of the tule does there, by the forward motion it gives to the last strutum of particly improfo the finger with the pulse that is felt . - Tho it is the that fluides when acted on prep in all directions yet in this care if the tube be region or undilatable there will be no lateral vibration, for since all bi: h bration requires space, and since no laboral space is the afforded by the permanent diameter of the tube, it w Sollowy that the longitudinal vibration or undulation is the only one that can take place or he fatt in the take - now the these vibrations are positively more: menty the space, yet the spaces are so small or the in the partiety of the fluid that are surrounded by

Nor let the leather be taken from the extre mity, the partiely at the end of the tube has ving nothing that they may impact their no fine t 400 The same h a tu un ti the some see species the property the a clim one of the contract of the date of the service human of and offered by the former of the free of ill fate a ris The that places when as a land on the hule u the comment to the test of the second Hu Cuit wo a w ex hes

other particly, but the advanced particly be at any place removed, the some sing particly having the lafore the more lee carried off from the map with a weekle welocity. the same would take place if the side of the Tigia tube which allawed no lateral vibration were to be opened, for space hing their aforded for a lateral vibration the partiely at the aperture wil be earried of with a visible pelocity. - a familian illustration of this may be given you by the action of a series of wory balls. If any mumber of there he sus pended in ovortact in a line, and the first be struck the last will in the same appearant moment sty of with a weible welveity, whilst ale the intermediate ones wile remain appearantly at sext, the it is certain they have papeled all the motion the lasts exhibit, but for so short a time or not te alcan a unilee belo city. - To apply there remarks to the circulations. Let us suppose the heart and blood bufuly fells and that the left wentricle contract, two owners of blood with their be arive a note the sorter, the arteries being univisedding tuber, at least them

65 ay to be the poli the two to te, to Vo and all the intermediate quantities of fluid will be with mane sommand with a welatity inversely pro: han sie portional to the capacity of the whet thro In e A which it flowers the most 10 m 1 = 40 the San 23 The to the Mo total aft our hadee comba

being anditutales by this blood thrown in the mo of the blood in the arterity and being will that of The solid column spoken of before, that is when the two armers are added to the arteries by the ven tricte, two aures will at the same appearant time be discharged from the veing into the right auxile pars since the artery and the being the heart have hearly the same capacity, if we suppose the two agrees of blood to papinte and accomply four webs of the port portion of the arting, jour ineles of the boxa cana with the emple of in the same time, and the portion of the wefole between the two extremes, will be passed one in time, proportioned to the energe of the areas of the apple of they afi = month the carpeteries, thus if we suppose the areas of at the capitains to be to the son of the contrary 50 to bushiel is the heart it conto the in the same time that the major best in the action or being poping on priches, that in the capilaries wile performen but the twelthe part of or inche) This motion of the solid or Continuous column of The blood by which it is made to change etyplace



continually in the suffels, is not the only effect proansed upon the maps of blood by the hearts, When the bentriele contracts forcibly on its contained low The solion sions of the caucity of the ventriete impart a shack to the blood, which like the blow inpressed on the leather in the instance of the tube above mentioned, courses a vibration or undutation that is sent out instantaneously to all parts of the bluid, aiministing however as is the care with ale bluid undulations, in proportion to its extent. -Thus the heart producer two manifest effets on the blood by it, contraction, first a comparitably slow motion of the whole map, and man immeasurably aufid undulation . - It is the last of three that con stitute, the arterial Pulse, I have already proved to you that the thole or pulse of the arteries is not produced by any allatation of the side of the upol, It only remains on this head to enquire if the Public may not be accasconed by the progress of the map of blood along the Eupel contractistingueshed from the rapide undulation. The only manner in which the map of blood could produce the sansation of a throb or pulse would be

38 an peta prete no plan for - cu will be an week as a sell with a sell a sell and oli ach the time or the un hi win in the 2hi lu f can be to she they Ama not not then is

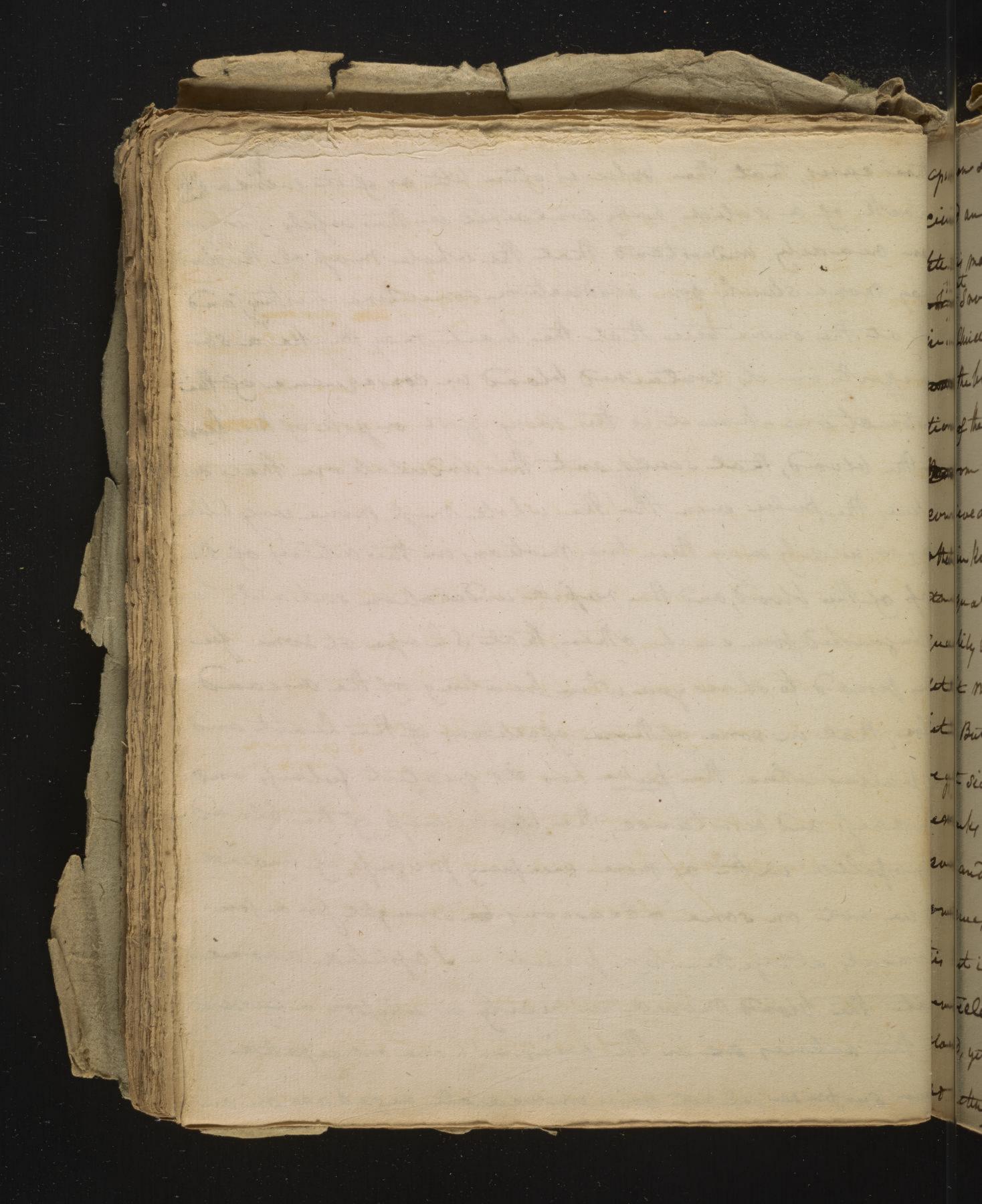
by flowing by jets or by an allemality enchanced and retained belocity, the beful. But I shall proved to you presently that the Wafe of blood does not plane in this manner, but in rearly as uni form current as it does in the veing - Swile only observe here that if the map of Wood moved by jets in the arteries the same species of motion moued be sun or felt in the veing for the blood on the arlines and wing being one continuary column, and that two mo ving in the same circle, the kind of motion in one must also be found in the other. without contrary reason can be shown have this contrary reason interpred to be shown in the increasing area of the arteries as Thy approach the veing - for it is said the blood flow ing napidly in the large while, it producer there a blow or Amol which is felt as the pulse, but in the smallen arteries the velocity is so much aimenished as to prevent The blood producing any sourchle impluses - This idea is approve a by the plus omena of aneurismy for here There is an increase of the area of the uppel by the ois tensions, and consequently a neauction of the belock of the blued, and yet we know that the throb or melse, so for brom being obliberated or lepered

en en som lur Time even ste of the then . W luci = 2 The who an-in au in Ami it Ve again, if it is the velocity of the blood that of his cause the souration of the pulse, how aus it 19 au happen, that when an actory is completely at he with fruction by a ligature, state there is a pulsation him and and encreased one too, just like the light to the ature, where by the very condition of the party, there it can be no welcreity of the blood. -

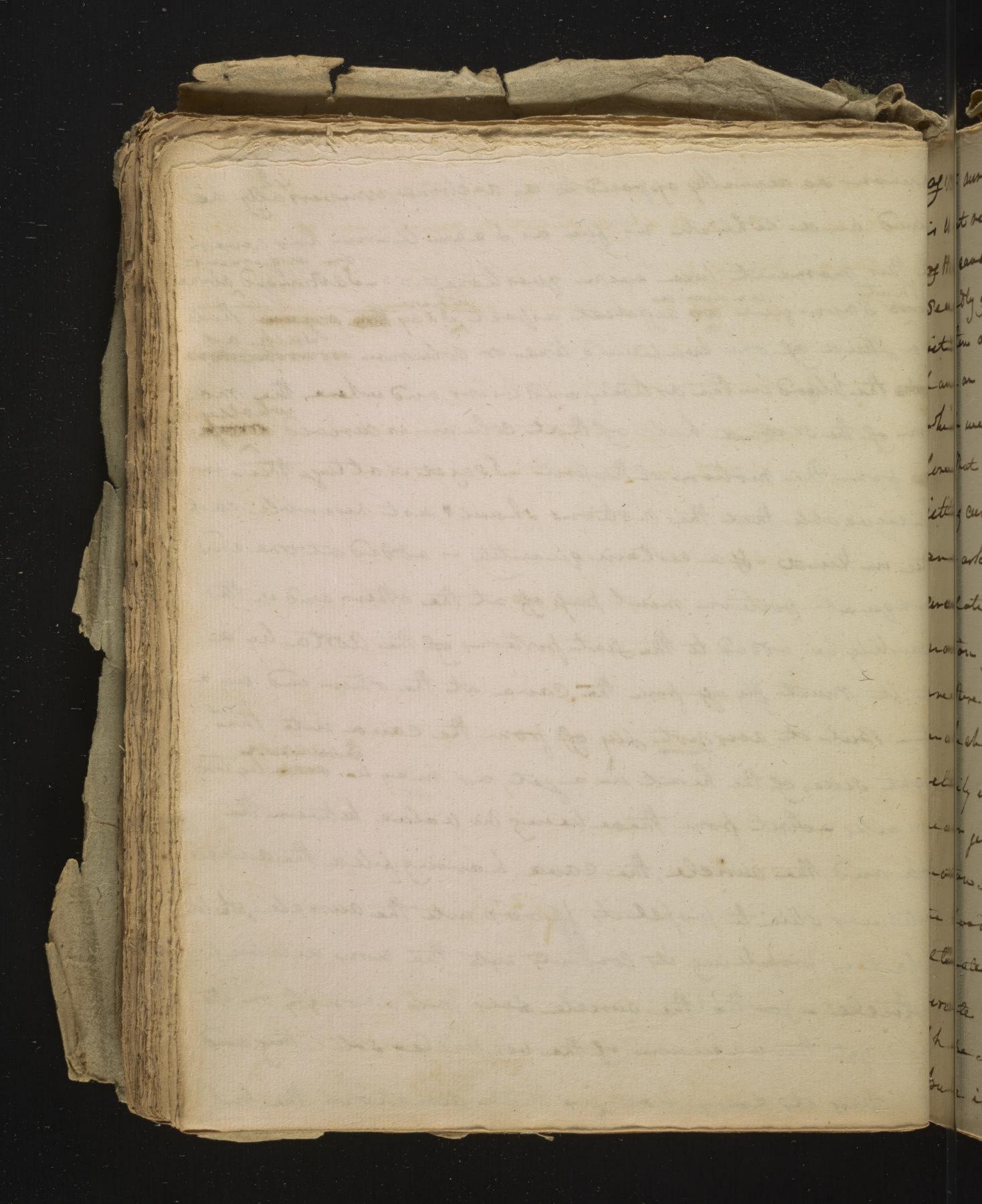
he the sack of an aneusism, is grencraly much enere ared in its porce byon a the pulse of the smaller acting leading atto et - This fact is en tirely consentant with the principle of the undulation I have laice down for if the pulse be produced by the napice slight of this undulations from the side of the centricle to the lapitaries, or perhaps beyond Hem where it our away thom I say it will pap with equal vlacity whether the space of leabely thro' which t moves be contracted or enlargedand in some enlarged parts of the sack of an an ausism, the undulation spreading in all directions the to continty, will give from the greater bull of fluide set in motion, a strongen empare on en sear being prefie .- But further that it is not the belacity morely of the map of black paping under the finger that creates the pulse that is felt is evident from this, when it beats 130 to 60 in a minute it is certain the alocity is about its greatest, and yet every practioner knows that there rapice pulses are silaam strong The strongest are generally when the palse is from 50. to go when the flood is at it, bast reclocity of it is un

the can the manufacture of the manufacture of the second of the se Ship 3 - CALLERY CHESTAL TELEVISION TELEVISION CONTRACTOR - FOR ACTUAL TO SERVICE AND ACTUAL TO no hos and the same of the same of the same of the same of pt the der and the form of the pulse in formation per with condition to the lapitaries on proportions My cet When it are vien as they I say the well from n. ble aginate ocher with the species till , the which to mover the contraction of the Lan & un and the same of the property and the same of -a 4th They und who was speaking in cold there . The quist to sometimes will give from the granding The knis rely tha wind and winder a stronger make are having prefer and fort forthern their 4 lu

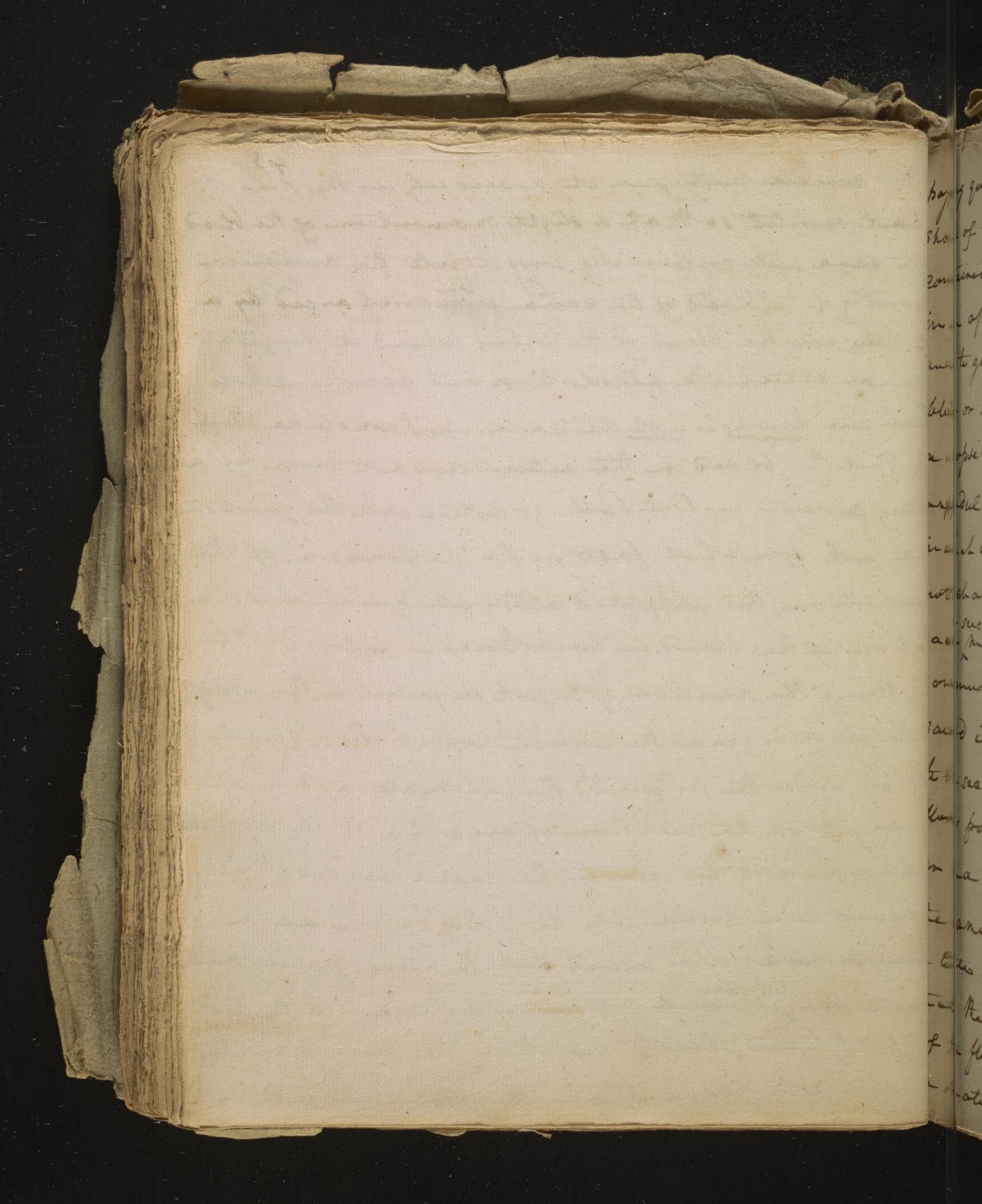
three cases, that the pulse is often felt as if it were the shack of a solid hody contained in the wefelt for you can madily understand that the whole map of the blood may more sluwly from abstruction comewhere courting, and yet at the same time that the heart may make a strong gor exects on its contained blood in consequence of this obstruction - haw it is this strong offert or gerte of the head on the blood, that sends ant the undulation that one stitute, the pulse even the the whole may move very little nay so widely may there two motions in the artery of the map of the blood, and the rapide undulation sent and, be. listinguished four each other, that I hape at some for ture period to show you when he ating of the diseased rube, that in some of those affections of the heart and its balvey where the pulse has its greatest fulnifo and haranels and resistance, the whole map of the blood is propella with a mere creeping progrep, if indeed it be not on some accasions be brought for a few moments altigethen to a pause. - Saputed alone that the blood moved in rearly as uniform a current in the artisies as in the being - I have auticipated your surpoise, of not your immediate negatives, on an



opinion so directly opposed to a austrine universally re cieved and which as far as I can learn has neven an argument the this moment been even questioned . - Sarbonerd above that some give too afferent aspect I say to again that in a Shire of one continued line or column as an too come tion of the second half of that column is derived and from the motion of the first - I say it is altage there in concieve able that the motions should not resemble each other in Kind - ya certain quantity is added at one and den equal portion ment pap of at the other and if the Enantity be a over to the Sint portions of the arota by a jet, it must fly off from the cava at the other end in a right side of the heart in a get, as may be and by two remarky - First from there being no value between the eava and the auricle, the cava having place the auricle continues of the to propel its blood into the auricle, whelit this last is propelling its contents into the now dilating ventricle. - for the the auriele does prep shongly on its blood, yet the vacuum of the ventricle soliciting and conduny its eary flow in that direction, the propur



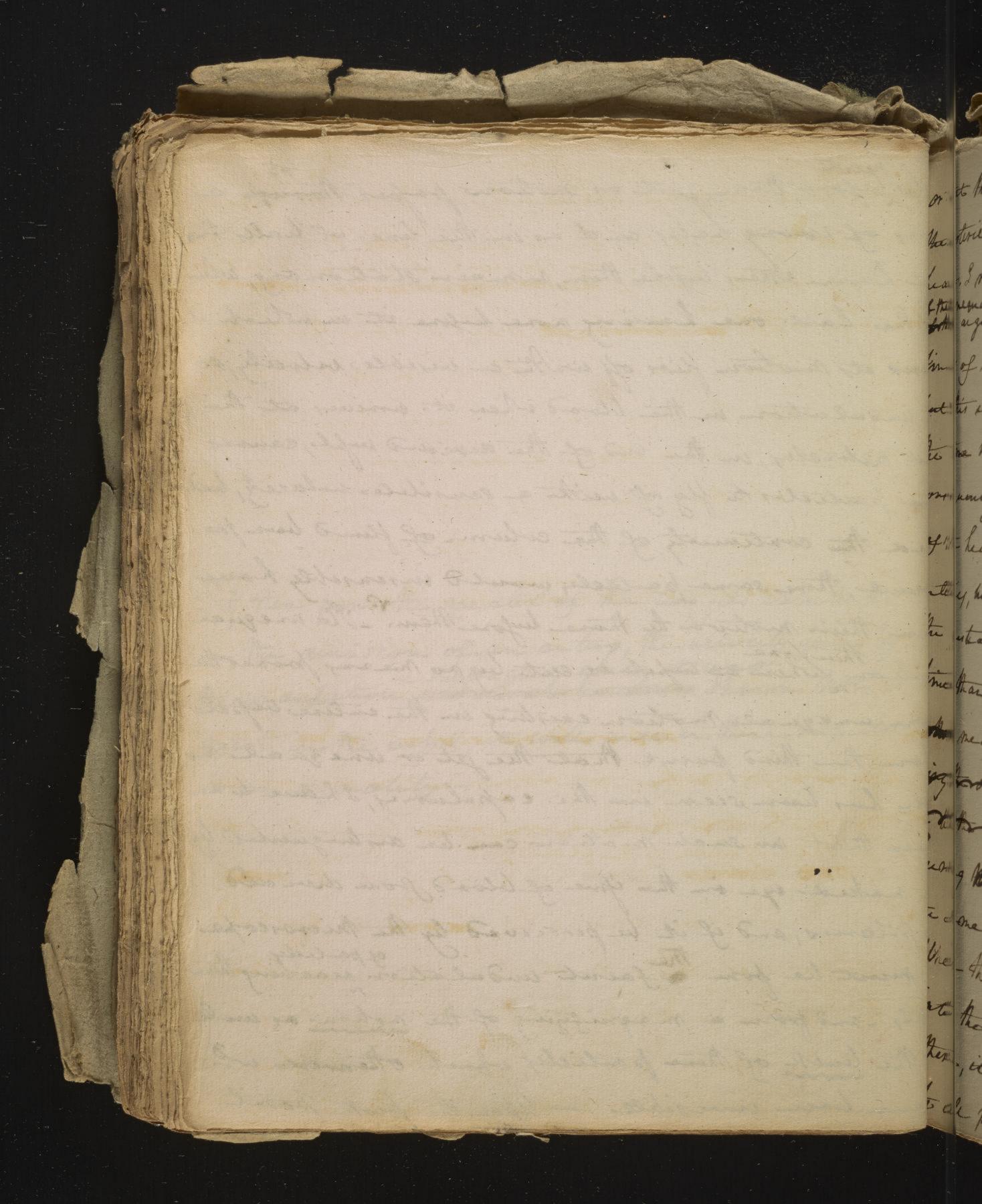
of the suricle must que it a velocity in the way it. is hast resisted so that a slight momentum of the blood of the cava will continually cong it into the auricles . secondly if the blood of the cana water airchanged by a jet them ale the blood of the view whind it must also have an alternate betardation and accelleration which we know is not the case. I down alware there fore that the blood in the activity does not move by a jetting current. I But I will go further with this quarton and ask fore what fast in the phenomena of the circulations, this shippered alternale quick and slow motion of the blood in the orteries is infered, - They one there. The simulation of a jirk on pulse in the arting in whe she it is said the current paper with a greater. beloaily under the Singer. 29. The alternate for their and he aren get on the division of an arting. 34. The alternate motion said to be seen in the capillaris, and 4 . None the blood being ariven into the arting by the heart, in elternate questes, it is infered that the same questing must pervate the artirial course: - In answer to the first I hope I have shown you that the throb felt in the pulse is not produced, by the map of blood in the vepel



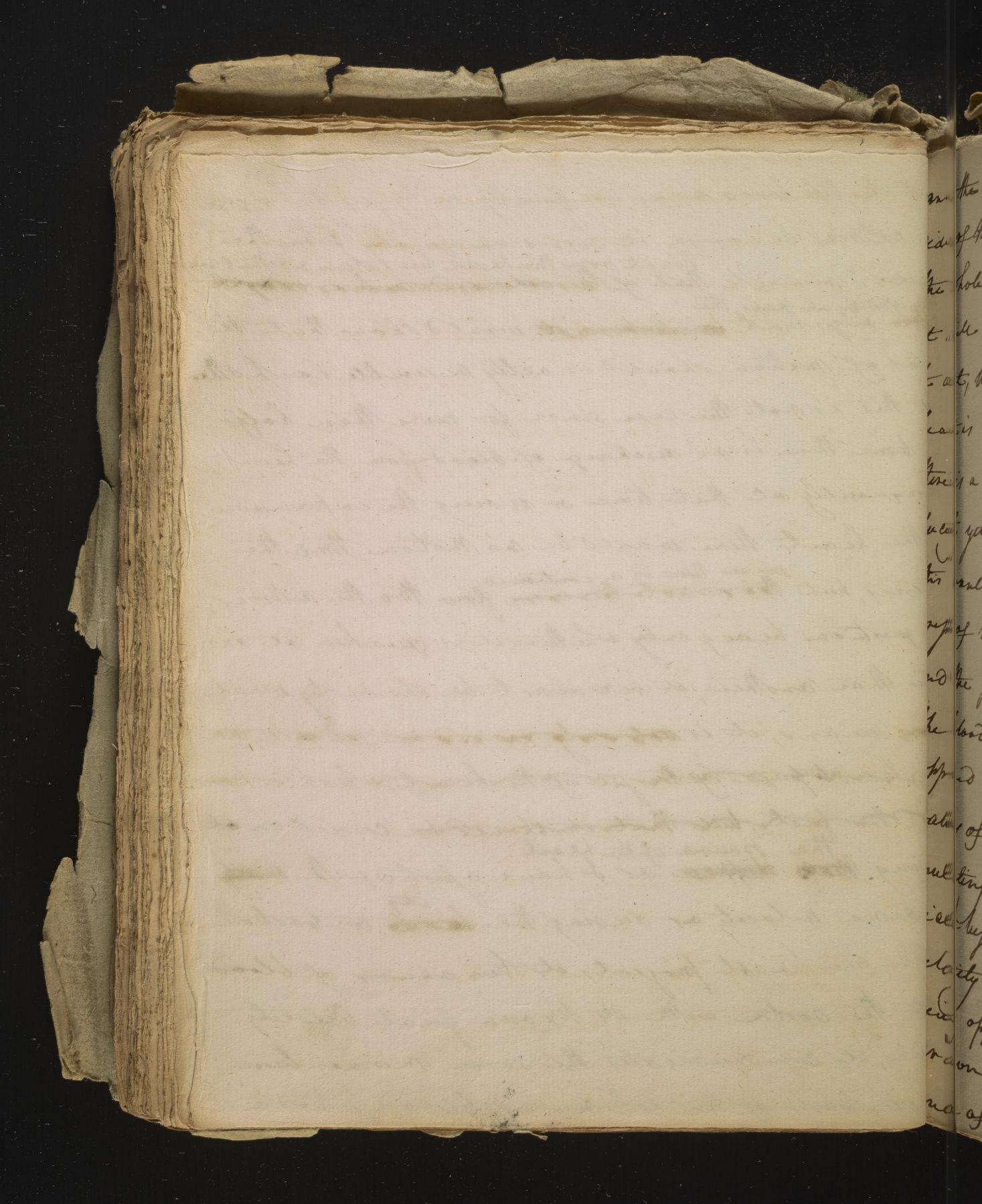
passing quickly under the singer, but by the beater on shock of the sides of the heart on the surface of its contained blood, sending aut an undulations that in an appearant instant spreads the system? and to give you a familian ellestration, just as, the blom or shade quen to one side of the absormer of a aropre eal patient, communicales in an instant anximoulation or pulse to the hand applied to the other. in which case it is scrtain the maps of the fluid has not changed its place. - its particles only having in sucception thro' infinitely small spaces, and thus communicated the impeters or shorete precioly as Sound is communicated thro the air - with acquad to the second fact it is thought that wither blood flumes from a cut artiry, with an atternably qual er and stower leap, the it must reasparily have The same variable motion within the vefrel, but a little reflection on the Whenomera wall track us that the inference is not got. From what I have said of the fluid undulations, you have understood, it is a mation of the partiely, communicated to the part

on of tran law m 66 won the the dul 'air buts ten fran Las the Em a; If then poon the greater of the two gets exhibited An unaulation, and when her shows shown hot to en. the nonion. 'an -un exist in the nepel, it will reduce there importers Epin - the to an equality -

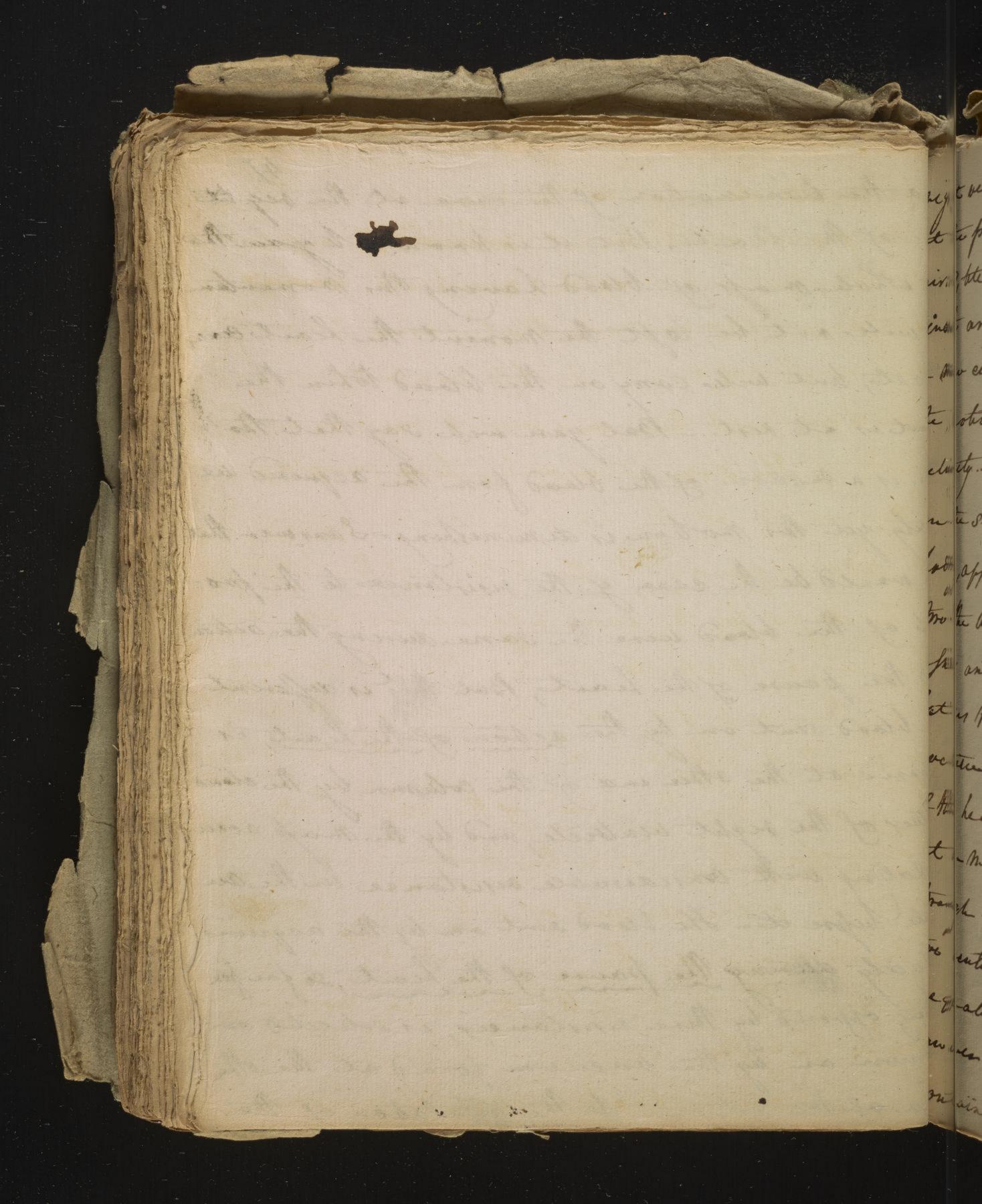
ictes before them, juit as motion paper through a sories of wong bally and as in the line of balls the that have others before them, he main station any, when as the last one having none before it in whech it wors at motion flier of with an visible velveity, so The undulation in the blood when it i arriver at The fast patricles, in the end of the division wifel, causes there particles to fly off with a sensitetes velocity, but had the continuety of the column of fluid been fre. served, there some partiely would unsimilly have guen their motion to those before them. - The unequal motion when a uspel is cut by no means proves the same unaqual motion existing in the intire befolo. Whom the third point that the jet or une qual mo tion has been seem in the capilaries I have to an I wen that no such mations can be distinguished by The naked eye on the ifine of blood from divided e aprilaries, and if it be percious by the Microscope on it. Meest be four of faint undulation reaching their t supply and from a magnifying of the motion as well us the bulk of these positiely, which otherwise we have been inversible. - Upon the fourth point



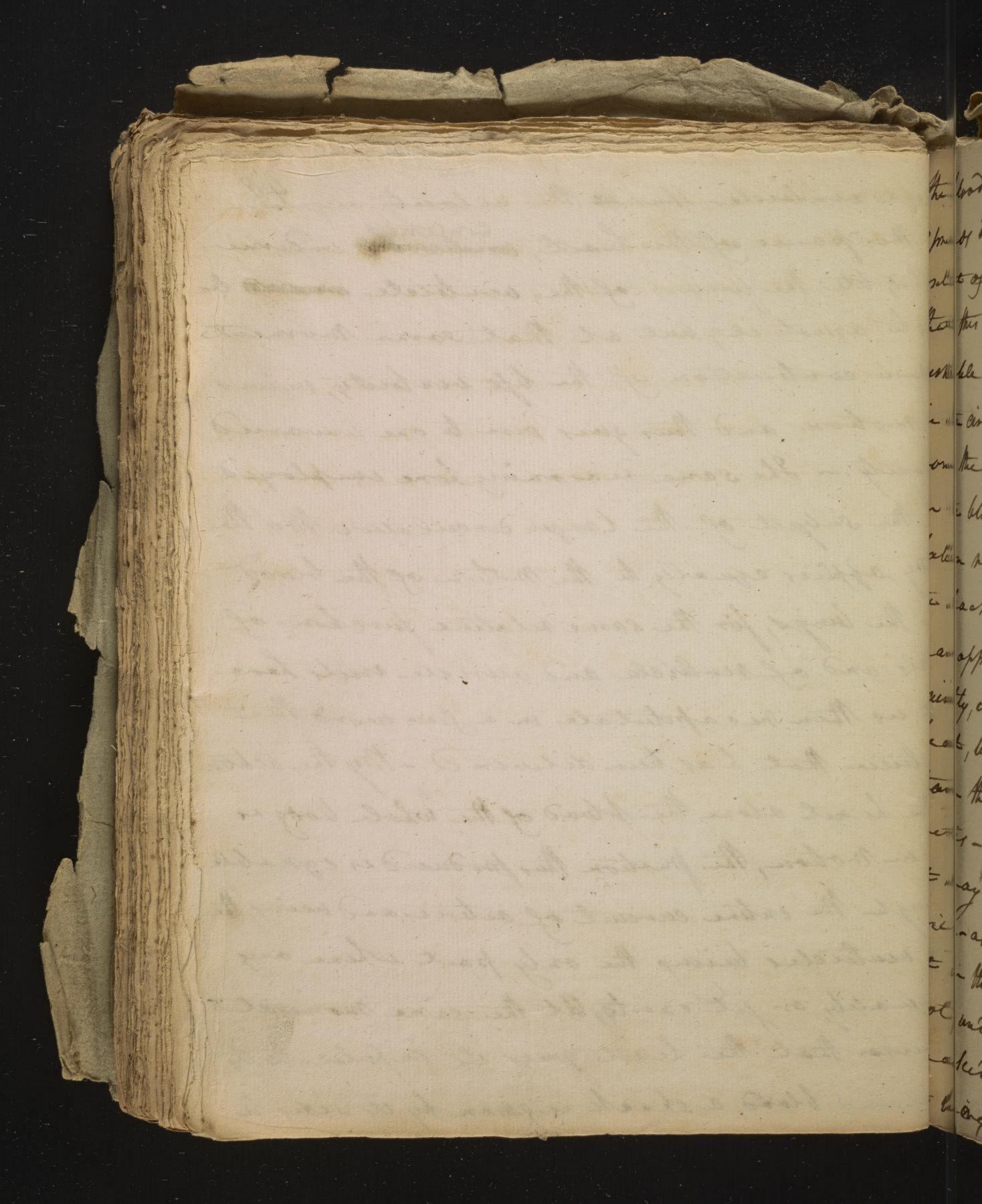
or that the blood moves unequally on by jity through the arteries because it moves unequally from the count heart. I remark that from the heart he taken as the count of they unequal from the of the would show that the Amas of motion should exactly resemble each other but this is not the case since for more than halfe the time there is no discharge of blood from the heart, consequently at that time or during the enpansion afthe heart there would be no motion. Amo the since there is a continued for the activity, the question being only whether it is quecker at one time than another, at semainer to be shown by what com means, it is not only correct on whate, who sight of fage of the per of the heart, which is brown muring the paine of the heart affects with me the same unlacity of during the Lines contraction in When the heast project, it two anner of blood it este the sorta with its lexaun great velocity there, it communicates the same momentum to all parts of the column of blood tutween it



ma the birmination of the case at the seglet side of the liast. But it is known to you than the whole mays of blood having this momentum it will not be loft the moment the heart can to act; but will carry on the blood when the heart is at rest. - But you will say that the there is a motion of the blood from the acquired be weety yet this motion is diminishing - Sans wer that this wanted be the case of the printance to the progrif of the blood were the same during the action and the pause of the heart, But the is different the blood sent on by the action of the heart, is opposed at the other ma of the column by the class values of the right bentriele, and by the map acen mulating with considerable assistance in the au viele before it - The blood sent on by the acquired belacity officing the pouse of the heart, so far for being opposed by there rejestances, is solicited on drawn on by the vacuum formed at the other by ena of the column by the dilatation of the



right venticele. Thus to the velocity acquired at the pause of the heart, within undernie: perho, the felling of the ventricle made be gind to anest it; but at that same moment a new contonation of the life verticity, swines the motion and thus gives rise to one unvaried belocity in the same reasoning here employed on the subject of the larger circulation the hady, applies equally to the motion of the blood the lungs, for the same relative furction of luftly and of penticle and auriele exists here. that us then be capitulate in a few word the auctive that has been delivered. - By the action of the heart alone the blood of the whole body is but in motion, the protion their produced is egrable Through the entire curent of actioning and being the Two wentercles being the only part where any me quality or jet exists, at the same moment however that the heart gives its impulse to the contained blood, a shack is given by it sidy to



the blood that sonds aut an undulation think Spread on an appearant tretaut the a cirtain enleat of the lifely - for your are to recollect that the undulatory impeters is in it, noture pe sushable often a certain entent, as may be sun he the circles that form on the surface of waters from the shock of a stone cart into it, - Now on the blood wefals, the extent to which this unda lation resher will measured by the force of The shack queue by the heart, In those cures of mar approach to death where the heart wats faintly, it is often manifect in the wefuly rean the heart, but lost in the entremeter, tho it is een toin the blood is state flowers thro these extre meties - again whem the heart heat, strongly It may be a ah inte and wen legand the capill anis. - as objection has premently actected the m jet en the espie of blood from the being of the it foot, under arcumstances, of M. Houten has he = - markers, that did not allow the possibility of its being caused by the pulsation of any contiguous

to 4aline of and the deside the series 5 4/ the officer and the desired the 20 1 the desired - for your day to decide to to cle Marie and the fill of the fill 21 d vier V. but which gives no sensible velocity to the in al blood the which it moves -1/1/2 mb to inchity by common my my repres "li Le and gover by the heart of there can, or u tus more to the water the family be and to 200 et es order and in fect in the inflict searf 00- 0 fort look on the extended thout is as ala the time all de the

artery - The whole motion of the blood has there two aspects, one unisom progress of the entire map round the circle from the left to the right hentricle, and superadded to this, an atternate undulation that rapidly autstips this current and dies away in the capilaries. It is the lange trainal flight with were of this undulation, that I ques the impression of the pulse when the finger is prefit upon the arting - and of is the same impulse that meeting with the opposition of the curvature or branching of upply, gives size to the locomotion or change of position of the whole artery that has so long been mustaken for The dilatation and contractions of its side for you are to understand that the sides of a strugter arting being paralele with the direction of flight of this undulation, no impulse will be fetton slightly touching the bane arting, not the moment the seder are prefito m, or a curvature opposes That paralelism is austraged, and the sides lung now opposed to the track of that undulation

'm le le re fe aus MEDICAL RESIDENCE AND THE RESIDENCE AND ADDRESS OF THE PERSON ASSESSMENT OF THE PERSON ASSESSMEN of the 3h whe The state of the s Een the transfer of the contract o the se the state of the s m Lu and the state of the second state of the second the same the same of the grant of the first The second secon with the state of the state of the state of the state of Lu the transfer of the second sec 14 4

will feel a shock or pulse proportional to the direct opposition that is made by such prof; your or curve . -Having on the precuding wiew ascribed the motions of the blood to the sole agency of the heart of Shale here answer the alycation that has always been made to this opinion, It is urged that the resistance from the friction of the blood on the surfaces of the innumerable while, and from the way he of the map of blood itself to be moved, as such that the power of the heart alone could to. wer overcome it - In estimating the probable ammaunt of the rejustance from them causes. S shall consider the human bady, in sty two defwent states of an evet and recumbant position In the enest postwe the blood in all the parts above the heart is moved against the influence of gravity in the activity, and in its direction accenting thro the being - In the party believe the heart this order is reversed by its assert ding the the actives and whilst

and a grade on there is no prediction from the commence 10 00 sist 1.2 -----the state of the first of the state of the s am 1 tt the state of the s 1-1 0' 0 The warming Care of which which we warm and with the state of 1/02 of the major of boloned when the bed been all to 0.12 the former of the land land to the same the re 1 ec A STATE OF THE WAS TO L

both above and below there is a simultan se: sustance from frection. - But in the party action The Least, mitter the sixiation so from frection nor the gracitation of the blood in the busy, is felt or to be aver come by the heart. - Hor smees In there party, the blood on the arteries and being is one continuous column, the tongtoto of blood in Nove two sets of heful would belone each other if the luber in which they are contained were of equal hight, but the arterial tube sering higher than the entrance of the cana to the heart, and that him you beauting the brught of the arterial will exceed that of the benous stem, consequently there will be a and the first and a survey of the last to mantain the equilibrium continually filice by blood from the heart, there will be a continual rising of the column

ME he A denty Atran I upon the principle leve laid down, we may Su a cause of the easy progreps of the blood But And The ling thened, and appearantly obstant will ting circulation of the lives -1.20 ala Lin a in pa

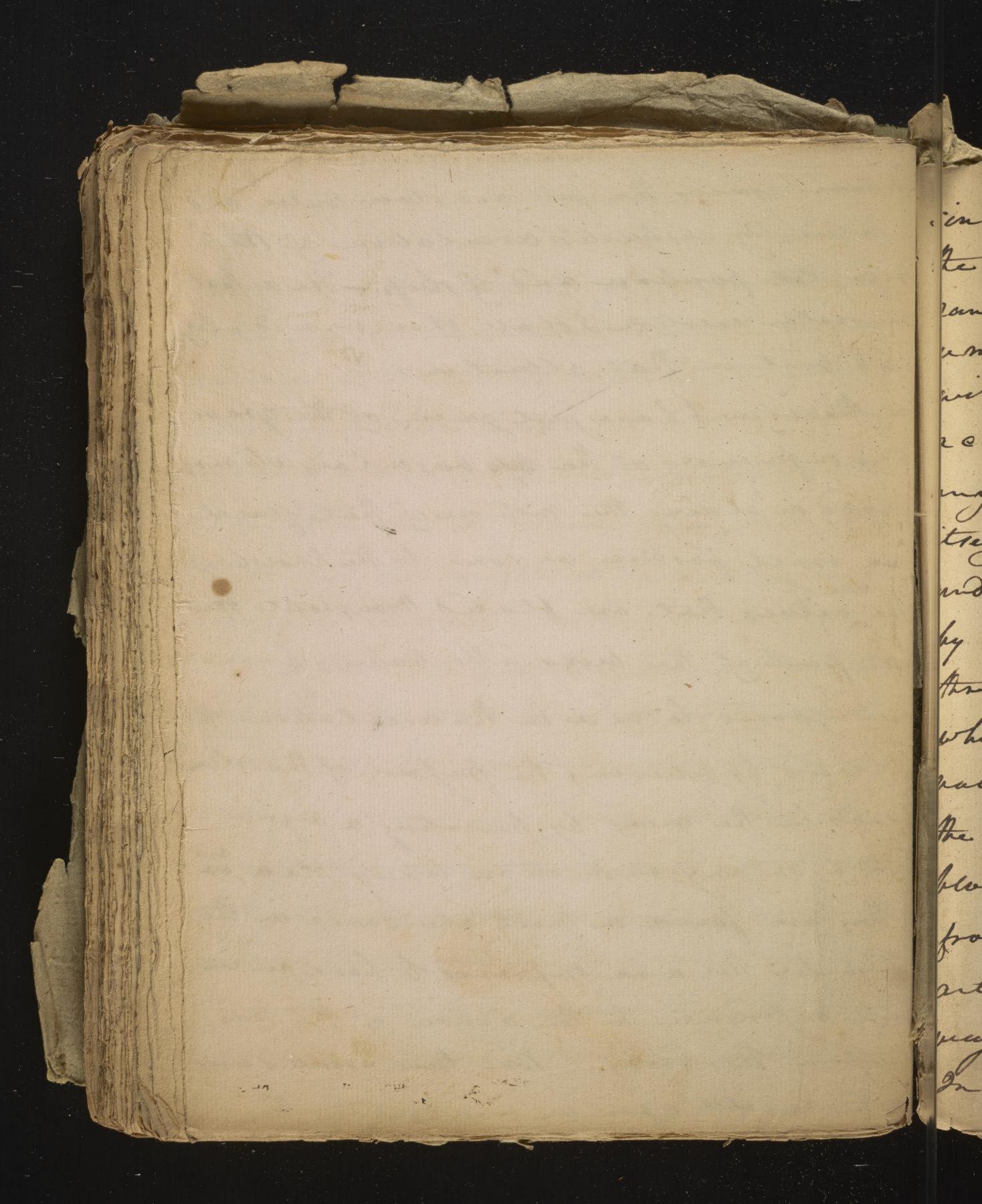
in the vient simply from the greater wiegto of the arterial Column. So that the weight of the wood and the separance of ety priction are hoth over come in these inferior pacts, by gra buty alone, with no further aid from the heart Than its constantly kuping the higher por = tion of the arterial stem fules. In the exect parture therfore the greatest labour of the heart will be to propel the blood against its gravity Amo the activity of the superior pats of the bady and to over come the pijitance of friction there Hence we find those animals whose heads are always or usually carried exect, have the heart placed near it, whilst those in whome the head is on the hongouton line, or below the have the heart scaled heren the conter of the whole length of body. - In the recumbert posture of the human boog. The six that gravity had given on over coming the friction of the blood in the parts below the heart mon econer, and the whole of this rejectance is thown upon the

The second of the second David on a morning of it had is. The pet. The first see of a comment of the see the 29 heo. Sold of the state of the ther: the second of the second te. Apple - State wt. the first the same of the sades as a orace describer on the house gas . me ta:

is thus hurdened with a new obstouction in The recemberat posture, it is at the same time pelimed from the labour of sending the blood against ets granety to all the parts above the heart - the at still has to consumber its facilion there - as in this position there is lette or no grand At overcome it appears that priction above is the abstacle to the recumberat circulation, and whether this or the exect position offers most resistance to the heart resolver itself into the question whether the secutiones of the gravity and frection of the blood sent to the pats above the heat, he greater or less that the friction alone is I believe one of the minimum of the pasts questions of Mysicology, but it would seem probable that the peristance of priction that aut the whole body in the necumbant seristance was the greatest, and that probably from

So It appears then that the fiction of the blood him on the before is the prescriptal if not the greatest of m segutance to the action of the heart. and the hund question is whether the heart is able to avereone of m et, how there exist no elements on which a precise late calculation can be framed, of the power of the of the he art and the wight of this resistance, it is he un profibe therefore to make a strict composison of the between them - or to found a pragment immedialignest upon them, they must then be miceted from the aste on quement, and their relationship saugett by more the Colealeral means. - now since the heart does nog be ost a force in corculating the blood - and since no gita other cooperating came or came have over been a. shown, the inference in the prejent state of an et Knowledge must be arown that the heart ten alone is sufficient for that circulation et

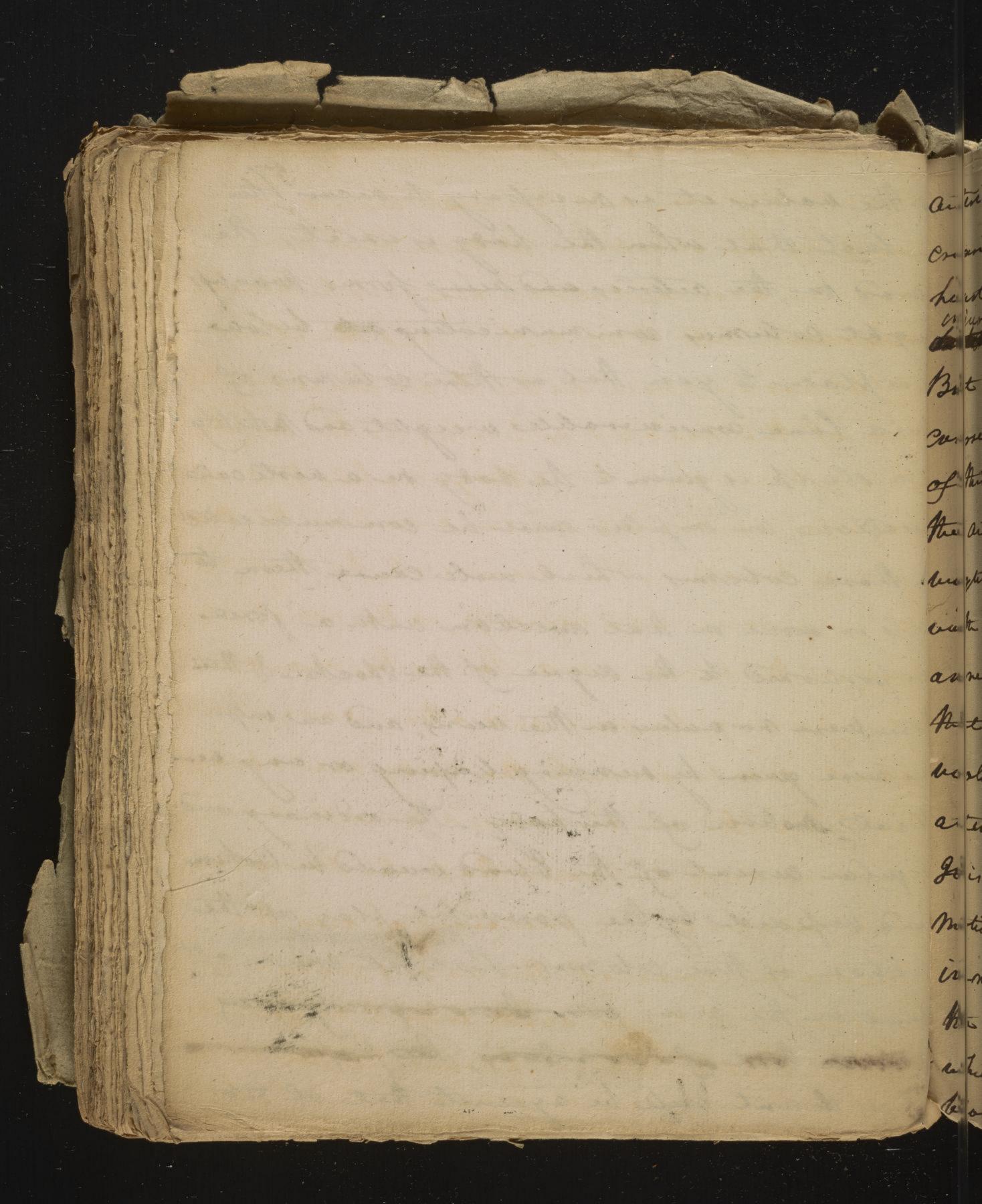
this care arress the full and slower pulse, and The frequently aly bucted arealation of the a horizontal position and of sleep. - The arfest tut of murcular exertion I shall show immediales hus no past in Rac alteration. ne Hom the view I have just queen of the grave in lating influence of the two vascular columns of bluss in aiding the motion of that fluid tis in an exect posture, we come to the Knowledge sow of the value, that one flaced throughout the oly greater pout of the wins . - He balue, home as been supposed to aid in the arculation of me the blood, by relieving the pressure of the column es of blood in the viery, by proventing a requir no gelation, on any obstruction laking place, or en as they are found in most abundance un the entremeting they were supposed to have an in temate reference to the action of the Mus: - der upan the views - But there aresiled uns mui be rejected upon an moestigation, Hor



Since the blood flawy uniformly in the very the walnes ment be always open and Lenea can appose nothing to the weight of the col ermen of blood. - nor can they were be closed without producing an objetuetion and an a commulation whind which if it continue any bugth of time will be back to the hear etself - hor is any thing gains by their preserve under muscalan action. - When a secen is propo by a musele the blood is anestes in els papage Atro et, an accumulation takes place behind which wile be the same whether there be so values or whether they be innumerable, for The accumulation takes place not from the blood propo backward by the nurse, but from the fush obcames arriving from the arteries. and the presence of values can in the very atter the impeters or quantity of these. In and we to make you sensible of the unet-

of - 4. th = 1 pu-9 Ze is fici y.a to 1 A m to is the importing of

of the walnes et is neafsany to neces the the fact that when the body is exect, the blood on the activity and seing forms two up peght columny communicating at below-It is plain to you that as there columns of fluide Lune considerable weeght and Mobility y a shack is given to the body me a vertical avection, an impitus must be communicated It those column which will cause them to mels on move in that direction with a force proportioned to the degree of the shock - Ithen There were no walvey in the veing, and an impetus were given by surving leaping or any bear tical motion of the bady the ordinary and regular current of the blood weered be broken and impeded by the powerful play of the motion of these columns . - But the column of price in the veins from along the in it decent will be against that of the



arterial column and this but being in : creand by the acception of more blood from the heast, an accumulation would take place injurious but to it, motion and structures -But let en suppose value to be placed in the Course of the venous column and the intoley of this column will be distroyed, while that of The arteries remaining, and far excuding the Mere wight of the other, the blood will be anven on with an accelerated velocity up the usual ch annel of the wing - and this is the news on that running baping, and other succession bealent shocks given to the body are always attended with an energied circulation. His commonly supposed that the musicalus motion producing there exercises is also the unnediate cause of this rapid motion of the blood - But you can't fails to observe that Whelst muscular action hasters the flow of the blood between the point of prepure and the host

Vo the blood may elude this internal pressure by ano a w and an external course. The circulation would be from more obstructed and east back in greater quanty or ! on the heart, from the arteries than the viers, if it and to were true that Museulan action has that effect oneula The motion of the blood which the received throng co Supposes. From the view I have just given of the least we of the value, their presence in the arteries is al produ together unnecessary. -I have Their quittemen indeavoured to set before heron you what Suile not cale a theory of the arculation to an for your reflections, but a display and arrangement and of its pheromera for you the test of your future ob. mite Servation and experiment, I would not wish with So far to change the auties of pupil and teacher of the as merely to the orige for you, an employment natt in which the master is ever inferior to the schallar. nor would I wolking by he guitty of the find high orime in science of offering to your mine to non at assess at the same time netard the from Whind he from the point of prepue to the activery - so that to on the whole there cauld be no gain of belief. to and this is conformable to fact, for where mus on enlar action alone takes place, as in many convulsure diseases, the pulse is more acceliveted to the argree that those other cacreens produce, it is commonly but bittle excelet above stand on frequency, and sometimes reduced much herow it - The walver therfore are not adapted to any use in a quies ent state of the body and were it never enpond to the kind of b. motion I have spoken of they would be all = he logether superfluour. - according to the doctiones of the values usually received they would be as may any to the proper function of the arteries as the veins for nattwithestanding the arteries are more region than the being and capable of resisting greater propure, state this the greater resistance is as nothing to the strang prepuse of the musely which surraund them, and since there is

genations on those points that promise un interminable deference of opinion a crime to publish persons and times wile be sure to ajuare the motifying penalty of oblivion. -If you wish to accumulate knowlage or fame, kup your unwanied attendance in The school of algoritation and experiment. But if your must sometimes play the true aut of seiner, go to the subjects of the I brain, of generation, and animal life, and exercise on them the partine fancies of a fabrilit. But other points of physiology that like the circulation are palpable and submetted to philosophical enquiry, amand a more many exection of intellect. famo Ruch Philadelphia Septemb 181%

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